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[Annual report]

MARYLAND

Agricultural Experiment Station.

BULLETIN NO. 37.

SPECIAL ISSUE.

COMPOSITION OF
COMMERCIAL FERTILIZERS
SOLD IN THIS STATE.

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COLLEGE PARK, MD.

FEBRUARY, 1896.

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MARYLAND

Agricultural Experiment Station.

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Located on the B. & O. R. R., 8 miles N. of Washington, D. C.

NOTE: Under the laws of Maryland, the Inspection, sampling and analysis of commercial fertilizers is to be done under the auspices of the Maryland Agricultural College, by the Professor of Chemistry of the College, who is ex-officio State Chemist. The results of these examinations, being agricultural information of value and general interest, will be published, from time to time, as Special Bulletins, from the Maryland Agricultural Experiment Station.

These Bulletins will be mailed, free, to any farmer who asks for them.

ADDRESS,

MARYLAND AGRICULTURAL EXPERIMENT STATION,
COLLEGE PARK, MARYLAND.

INSPECTION AND ANALYSIS OF

COMMERCIAL FERTILIZERS SOLD IN MARYLAND.

BY THE CHEMICAL DEPARTMENT OF THE

MARYLAND AGRICULTURAL COLLEGE.

Dr. H. B. McDonnell, *State Chemist.*
*H. C. Sherman, B. S., *Assistant Chemist.*
F. P. Veitch, B. S., *Assistant Chemist.*
F. B. Bomberger, B. S., *Assistant Chemist.*
W. W. Skinner, B. S., *Assistant Chemist.*
C. C. McDonnell, B. S., *Assistant Chemist.*

The following tables give, side by side, the analysis of each fertilizer as made in the laboratory and the analysis guaranteed. The analyses are given in the parts per hundred. For example, if the number 1.09 occurs in the column marked "potash found," it means that the fertilizer to which it refers is found, by analysis, to contain one pound and nine one-hundredths of a pound of potash in each 100 pounds of the fertilizer. In this case the manufacturer would probably guarantee one pound of potash in each 100 pounds of fertilizer, or one per cent.

The majority of the fertilizers analyized this season are up to the manufacturers' guarantee, but the race to make "cheap" fertilizers results in many low guarantees and low-grade goods. Even dissolved S. C. Rock is frequently adulterated or diluted with dirt. This diluted fertilizer is made by mixing about 1400 pounds of dissolved S. C. Rock with enough dirt to make a ton of the mixture, which can then be sold for less than a ton of the pure dissolved rock. It is plain, however, that it would be sold for more than the price of the 1400 pounds of fertilizer alone, because it costs the manufacturer something to haul the dirt to the factory and mix it with the fertilizer; more bags are required, more freight to pay, more bulk for the consumer to haul and spread and the manufacturer must have a profit from the operation.

The schedule of valuations used in calculating the "comparative values" in this bulletin is the same as used in the July Bulletin (No. 34), and will be found on the last page.

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*Leave of absence for one year from July 1, 1895.

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2269	Alexandria Fert. & Chem Co., Alexandria. Va.	Dissolved S. C. Bone	Williamsport
2583	A. Anderson & Co., Mt. Airy, Md.	Harvest Queen Guano	Mt. Airy
2458	Baker & Morgan, Aberdeen, Md.	Pure Raw Bone Meal	Aberdeen
2325	Baltimore Guano Co., Baltimore, Md.	B. G. Ammoniated Bone Phosphate.	Hampstead
2569	" " " "	Baltimore Special Wheat Mixture.	Hurlocks
2570	" " " "	Eagle Phosphate	Hurlocks
2568	" " " "	Farmers' Alkaline Bone	Hurlocks
2326	" " " "	†Farmers' Dissolved Bone.	Hampstead
2403	Baltimore Pulverizing Co., Baltimore, Md.	Anti-Acid Phosphate	Germantown
2404	" " "	Farmers' Favorite Fertilizer.	Germantown
2402	" " "	Special Potato Mixture	Germantown
2385	Baugh & Sons Co., Baltimore, Md.	Animal Bone and Potash Compound.	Taneytown
2271	" " " "	Ammoniated Dissolved Animal Bone.	Williamsport
2132	" " " "	Bone Meal, Warranted Pure.	Baltimore
2345	" " " "	Crop Grower	Ellicott City
2376	" " " "	Day's Ammoniated Bone Phosphate.	Monrovia
2284	" " " "	Double Eagle Phosphate	Gaithersburg
2367	" " " "	Export Bone with Potash	Hoods Mills
2303	" " " "	General Crop Grower	Corbett
2139	" " " "	High Grade Acid Phosphate or Dis. S. C. Rock	Baltimore
2366	" " " "	Old Stand-By Raw Bone Phosphate.	Sykesville

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†Dissolved S. C. Rock.

Maryland Agricultural College, September, 1895, to January, 1896.

No.	NITROGEN Calculated as AMMONIA.		POTASH, K_2O.		PHOSPHORIC ACID.					**Comparative Value per Ton Found.**	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.	Insoluble Found.	**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2269	....	....	....	......	.77	**13.75**	14	**14.52**	15½	**$13.75**	$14.00
2583	**1.09**	1	**1.03**	1	3.68	**9.91**	9.	**13.59**	*22	**18.40**	15.40
2458	**4.53**	4	....	......	....	.....	...	... **22.42**	*47	**28.11**	......
2325	**1.58**	1½	**2.45**	2	2.78	**8.05**	8	**10.83**	10	**18.52**	17.30
2569	**1.21**	1	**2.23**	2	2.30	**8.03**	9	**10.39**	11	**16.88**	17.00
2570	**.55**	½	**1.00**	1–2	1.89	**10 99**	10	**12.88**	12	**16.97**	15.70
2568	......	....	**2.40**	2	2.08	**9.49**	10	**11.57**	12	**12.72**	12.80
2326	.....	....	.....	....	1.7	**14.50**	14	**16.21**	15	**14.50**	14.00
2403	.....	.... ..	**1.86**	3¼	.67	**6.49**	4½	**7.16**	*10	**8.35**	8.65
2404	**1.30**	1	**2.13**	1	1.16	**5.84**	4½	**7.00**	*10	**13.74**	9.40
2402	**2.88**	2	**3.44**	4	3.35	**5.34**	4¼	**8.69**	*10	**20.50**	15.10
2385	**2.83**	2	**1.86**	2	3.35	**9.71**	8	**13.06**	10½	**24.01**	19.10
2271	**2.31**	2	.....	... ...	2.31	**9.65**	8	**11.96**	*22	**19.90**	16.80
2132	**5.09**	4	.....	....	......	......	...	.... **22.03**	21.	**30.93**	......
2345	**1.78**	1	**1.36**	1	2.27	**8.36**	8	**10.63**	10	**18.09**	14.80
2376	**2.03**	2	**2.29**	2	2.57	**10.10**	8	**12.67**	....	**22.04**	10.60
2284	**2.86**	2½	**1.03**	½	3.14	**8.83**	8	**11.97**	10½	**22.09**	19.10
2367	**2.99**	2	**2.05**	2	5.00	**7.92**	11.	**12.92**	*23	**23.52**	21.20
2303	**1.73**	1	**1.40**	1	2.47	**8.82**	8.	**11.29**	10½	**18.65**	15.10
2139	....	.... ..	.....	....	1.17	**14.05**	14.	**15.22**	15.	**14.05**	14.00
2366	**3.43**	2	**1.24**	1	3.08	**8.58**	8.	**11.66**	10½	**20.68**	18.10

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2270	Baugh & Sons Co., Baltimore, Md.	Pure Dissolved Animal Bones.	Williamsport
2386	“ “ “ “	Reindollar & Co.'s Fish Phosphate.	Taneytown
2344	“ “ “ “	Wheat Fertilizer, for Wheat and Grass.	Ellicott City
2520	Beck & Walker, Chestertown, Md.	Propagator	Chestertown
2519	“ “ “	Trustworthy	Chestertown
2521	“ “ “	Try Me	Chestertown
2604	B. A. Betts, Chewsville, Md.	Dissolved Bone	Chewsville
2559	J. B. Beverly & Bro., Winchester, Va.	Beverly Mixture	Pocomoke
2340	A. D. Birely & Son, Ladiesburg, Md.	Ammoniated Bone Phosphate.	Rocky Ridge
2141	“ “ “ “	Dissolved Bone	Baltimore
2190	D. Blocker & Co., Baltimore, Md.	High Grade Superphosphate of Bone.	Westminster
2311	E. K. Bollinger, Seitzland, Pa.	Ammoniated Bone Phosphate.	Gorsuch Mills
2649	Chas. E. Bond, Spencerville, Md.	Ammoniated Dissolved Bone.	Spencerville
2646	“ “ “	Number Three	Spencerville
2644	“ “ “	Number Four	Spencerville
2647	“ “ “	Pure Bone Dust	Spencerville
2645	“ “ “	Regular Barnsley	Spencerville
2624	S. B. Broadbeck, Broadbecks, Pa.	Reliable	Loys
2625	“ “ “	Standard Ammoniated Phosphate.	Loys
2440	Brumfield & Foster, Colora, Md.	Acid Phosphate and Potash.	Colora
2525	“ “ “	Ammoniated Bone Phosphate.	North East

Maryland Agricultural College, September, 1895, to January, 1896.

No.	NITROGEN Calculated as AMMONIA.		POTASH, K_2O		PHOSPHORIC ACID.					Comparative Value per Ton Found.	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	Found.	Guaranteed.	Insoluble Found.	Found.	Guaranteed.	Found.	Guaranteed.		
2270	3.95	2	....	....	2.33	15.76	10.	18.19	16.	$32.16	$21.60
2386	2.12	2	2.42	1	2.11	10.26	8	12.37	11.	22.36	18.40
2344	2.24	2	2.58	2	3.45	8.95	8	12.40	11.	22.11	19.40
2520	1.06	1	2.93	2	.94	9.81	10	10.75	....	18.44	17.00
2519	1.51	1½	2.65	2	.32	11.79	10	12.11	....	21.51	18.50
2521	....	....	3.18	3.	2.56	10.57	10.	13.13	11.	14.77	13.40
2604	2.22	2.78	....	....	1.94	7.54	10.22	9.48	*28.53	16.87	22.31
2559	2.11	2.	1.69	1½	5.95	7.57	6½	13.52	*30	20.67	19.80
2340	.71	½	1.57	1.63	2.62	8.98	8	11.60	10	16.05	13.93
2141	1.53	1¼	....	....	1.12	11.79	11½	12.91	....	19.41	17.55
2190	1.47	1½	1.54	1	3.05	9.61	8	12.66	*20	19.31	16.30
2311	1.06	1½	1.15	1½	1.52	10.14	9	11.66	10	17.41	17.40
2649	3.30	....	2.18	....	5.34	9.72	....	15.06	....	26.94	......
2646	3.22	....	3.33	....	4.91	7.78	....	12.69	....	25.28	......
2644	2.31	....	2.58	....	4.80	9.35	....	14.15	....	23.61	......
2647	4.76	....	....	....	....	....	....	22.29	....	23.83	......
2645	3.45	....	2.56	....	6.52	8.55	....	15.07	....	27.08	......
2624	1.16	1	1.05	2½	1.39	10.14	9	11.53	....	17.53	16.30
2625	2.12	2	2.38	2	1.39	9.20	9	10.59	....	20.61	18.80
2440	....	....	2.15	2	2.33	11.65	11	13.98	....	14.73	13.00
2525	1.98	2	2.22	2	1.10	9.58	9	10.68	10	20.32	19.40

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2439	Brumfield & Foster, Coloro, Md.	Hard Times Ammoniated Phosphate.	Colora
2438	“ “ “	High Grade Acid Phosphate.	Colora
2210	John Bullock & Son, Baltimore, Md.	Pure Ground Raw Bone	Baltimore
2327	Chemical Co., of Canton, Baltimore, Md.	Special Wheat and Grass Mixture.	Greenmount
2205	“ “ “	Dissolved Ammoniated Bone.	Westminster
2329	“ “ “	Dissolved Bone Phosphate.	Alesia
2201	“ “ “	Gem Phosphate	Westminster
2204	“ “ “	Harrow Brand Wheat Grower	Westminster
2419	“ “ “	High Grade Baker's Standard Guano.	Bel Air
2202	“ “ “	Pure Dissolved S. C. Bone.	Westminster
2200	“ “ “	Red Clover, Wheat and Rye, Grass and Clover	Westminster
2428	R. L. Christie & Co , Baltimore, Md.	Farmers' Famous Bone Phosphate.	Colora
2528	“ “ “ “	Pure Ground Bone	Leslie
2430	“ “ “ “	Soluble Bone and Potash	Colora
2429	“ “ “ “	Sure Crop Ammoniated Phosphate.	Colora
2431	“ “ “ “	Unexcelled Acid Phosphate.	Colora
2427	“ “ “ “	Wheat and Grass Special	Colora
2435	E. A. Clendennin & Bro., Colora, Md.	High Grade Acid Phosphate.	Colora
2432	“ “ “	National Standard Ammoniated Phosphate.	Colora
2436	“ “ “	Pure Dissolved Bone	Colora
2433	“ “ “	Pure Ground Bone	Colora

Maryland Agricultural College, September, 1895, to January, 1896.

No	NITROGEN Calculated as AMMONIA.		POTASH, K₂O.		PHOSPHORIC ACID.					**Comparative Value per Ton Found.**	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.	Insoluble Found.	**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2439	1.26	1	1.00	1	2.14	10.40	10	12.54	11	$18.54	$16.60
2438	....	....	....	....	1.58	14.66	14	16.24	....	14.66	14.00
2210	5.44	4.92	....	....	....	....	....	20.25	25.20	27.95	....
2327	1.25	1	1.89	2	1.94	9.22	9	11.16	11	17.86	17.00
2205	2.71	2½	....	....	4.83	9.42	9	14.25	....	22.33	18.30
2329	.47	¼	....	....	2.17	12.74	13	14.91	15	17.99	17.55
2201	....	....	....	....	2.38	12.82	12	15.21	....	12.82	12.00
2204	.82	½	1.26	1	1.58	9.81	10	11.39	12	16.44	15.70
2419	2.65	2½	2.30	2½	2.26	8.33	9	10.59	....	21.61	20.80
2202	....	....	....	....	2.75	14.18	14	15.93	....	14.18	14.00
2200	1.08	1	2.50	2	2.15	5.47	5	7.62	6	13.59	11.60
2428	.69	1	2.46	2	1.34	10.12	10	11.46	12	17.47	18.20
2528	4.36	4	....	....	....	....	....	24.41	22	25.95	....
2430	....	....	2.18	2	.78	11.37	11	12.15	12	13.87	13.40
2429	1.33	1	2.02	3	1.39	10.48	9	11.87	11	19.42	18.00
2431	....	....	....	....	.54	16.27	13	16.81	15	16.27	13.00
2427	2.12	2	2.01	2	1.15	9.54	10	10.69	13	20.51	21.80
2435	....	....	....	....	2.12	14.20	14	16.32	....	14.20	14.00
2432	1.71	1½	1.95	1½	2.50	9.98	10	12.48	13	20.56	19.80
2436	1.71	2	....	....	.72	14.82	14	15.54	15	23.34	23.40
2433	5.03	4	....	....	....	....	....	23.28	*45	26.64	....

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2434	E. A. Clendennin & Bro., Colora, Md.	Soluble Bone Phosphate..	Colora
2437	" " "	Wheat and Grass Special Compound.	Colora
2424	Henry Cope & Co., Lincoln University, Pa.	Ammoniated Bone Phosphate.	Conowingo.
2524	J. A. Cranston Co., Newport, Del.	Ground Raw Bone..	North East.
2320	Crocker Fertilizer & Chemical Co., Buffalo, N. Y.	Ammoniated Practical Superphosphate.	Hampstead
2393	" " "	Ammoniated Wheat and Corn Phosphate.	Walkersville
2196	" " "	Niagara Phosphate	Westminster
2282	Cropley & Boteler, Washington, D. C.	Ammoniated Bone Superphosphate.	Gaithersburg
2409	" " "	Dissolved S. C. Bone	Boyds
2168	Cutshall & Stimmel, Woodsboro, Md.	Ammoniated Bone Phosphate.	Baltimore
2397	" " "	Ammoniated Soluble Bone.	Woodsboro
2396	" " "	Soluble Bone Phosphate..	Woodsboro
2532	Wm. Davison & Co., Baltimore, Md.	Dissolved S. C. Bone	Baltimore
2148	" " " "	High Grade Ammoniated Superphosphate.	Baltimore
2408	E. E. DeLashmutt, Frederick, Md.	Animal Bone Mixture	Dickerson
2368	" " "	Pure S. C. Bone	Woodbine
2538	" " "	Pure S. C. Bone	Clarksburg
2377	" " "	Soluble Bone Phosphate Mixture.	Frederick
2546	L. E. P. Dennis, Crisfield, Md.	Fish and Potash Mixture No. 1.	Crisfield
2547	" " "	Truck and Tomato Guano	Crisfield

Maryland Agricultural College, September, 1895, to January, 1896.

No.	NITROGEN Calculated as AMMONIA.		POTASH, K_2O.		PHOSPHORIC ACID.					Camparative Value per Ton Found.	Comparative Value per Ton Guaranteed.
					Insoluble Found.	Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.		**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2434	.....	....	**2.10**	2	2.80	**10.35**	10	**13.15**	11	**$13.57**	$12.40
2437	**1.69**	1½	**2.57**	2	2.57	**9.95**	9	**12.52**	....	**21.12**	16.55
2424	**1.15**	1	**1.81**	1½	1.13	**9.34**	8	**10.47**	10	**17.15**	15.30
2524	**4.67**	4	....	....	.....	....	....	**21.27**	19	**22.97**	......
2320	**1.29**	1	**1.54**	1	2.25	**8.36**	8	**10.61**	*18	**16.79**	14.20
2393	**2.46**	3	**2.01**	1.60	1.60	**10.65**	10	**12.25**	*23	**23.13**	22.60
2196	.....	....	....	....	1.93	**11.84**	11½	**13.77**	*25	**11.84**	11.50
2282	**1.48**	2	**2.16**	2	2.34	**7.75**	9	**10.09**	....	**17.30**	18.80
2409	.....	....	....	....	.78	**14.24**	14.	**15.02**	*32	**14.24**	14.00
2168	**1.07**	1	**1.68**	1	1.95	**10.03**	8	**11.98**	....	**18.10**	13.60
2397	**.73**	½	....	....	2.33	**12.55**	12	**14.88**	....	**18.65**	15.90
2396	.....	....	....	....	1.05	**12.61**	14.	**13.66**	....	**12.61**	14.00
2532	.. ..	....	....	....	2.84	**13.10**	13.	**15.94**	16	**13.10**	13.00
2148	**2.82**	2¾	**2.76**	2¾	3.40	**11.87**	10.	**15.27**	13.	**27.50**	25.30
2408	**.64**	1	**.65**	1	2.45	**15.51**	10	**17.96**	....	**25.85**	16.00
2368	.....	....	....	....	1.21	**14.69**	14	**15.90**	......	**14.69**	14.00
2538	.....	....	....	....	2.17	**11.88**	14	**14.05**	....	**11.88**	14.00
2377	**.52**	½	**.41**	1	2.98	**11.84**	10	**14.82**	....	**18.02**	14.50
2546	**1.91**	3½	**4.13**	3½	1.53	**9.09**	7	**10.62**	....	**21.68**	22.40
2547	**2.41**	3.	**2.55**	3	1.48	**9.06**	7	**10.54**	....	**21.54**	20.40

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2140	Detrick Fertilizer & Chemical Co., Baltimore, Md.	Ammoniated Bone Phosphate.	Baltimore....................
2206	" " "	Dissolved Bone....................	Baltimore....................
2207	" " "	Dissolved S. C. Bone........	Baltimore....................
2410	" " "	Farmers' New Method......	Silver Spring.............
2149	" " "	Imperial Compound.........	Baltimore....................
2213	" " "	Imperial Compound.........	Baltimore....................
2136	" " "	Mason's No. 4.....................	Baltimore....................
2137	" " "	Pure Fine Ground Animal Bone.	Baltimore....................
2308	" " "	Soluble Bone Phosphate and Potash Fertilizer.	White Hall.................
2138	" " "	Special Mixture..................	Baltimore....................
2382	" " "	Stouffer's Ammoniated Bone Superphosphate.	Frederick....................
2306	" " "	Vegetator	White Hall.................
2212	" " "	Wheat Fertilizer.................	Baltimore....................
2346	J. W. Dorsey, Ellicott City, Md.	Ammoniated Phosphate..	Ellicott City..............
2342	" " " "	Mixture "D".......................	Ellicott City..............
2535	Dudley & Carpenter, Baltimore. Md.	Special Wheat Mixture....	Baltimore.......... ....
2217	P. P. Dunan, Baltimore, Md.	Ammoniated Alkaline Guano.	Baltimore....................
2388	T. H. Eckenrode, Taneytown, Md.	O. K. Phosphate.................	Taneytown..................
2514	T. W. Eliason, Chestertown, Md.	Chester Compound..........	Chestertown ....
2319	" " "	M. P. Dis. Bone Phos. S. C., & Muriate of Potash	Baltimore....................
2509	Emory & Burgess, Centreville. Md.	Bone and Potash................	Centreville ....

Maryland Agricultural College, September, 1895, to January, 1896.

No.	NITROGEN Calculated as AMMONIA.		POTASH, K_2O.		PHOSPHORIC ACID.					Comparative Value per Ton Found.	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.	Insoluble Found.	**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2140	1.52	1½	1.02	1	1.15	9.84	9.	10.99	*24	$ 18.08	$17.50
2206	2.82	2½	....	....	3.21	9.79	10.	13.00	12	22.14	20.70
2207	....	....	....	....	.56	14.69	14.	15.25	*32	14.69	14.00
2410	2.18	2½	....	....	4.70	8.72	8	13.42	9	19.82	17.70
2149	1.13	1	1.00	1	2.22	9.46	9	11.68	10½	17.07	15.70
2213	1.10	1	1.05	1	1.40	9.62	9	11.02	10.	16.73	15.40
2136	2.36	2½	1.20	1	1.75	9.07	9	10.82	....	20.21	19.30
2137	4.45	4½	....	....	....	....	....	21.19	*45	29.72	......
2308	....	....	2.13	2	1.91	10.12	10	12.03	*25	13.01	12.80
2138	1.05	1	1.04	1	3.00	8.92	8	11.92	*22	16.69	14.80
2382	1.52	1½	1.64	1½	2.12	10.86	11	12.98	....	20.56	19.20
2306	2.46	2½	1.82	1½	2.29	10.01	10.00	12.30	12.	22.58	22.20
2212	1.03	1¼	...	....	2.30	9.43	10.	11.73	11	15.79	16.35
2346	2.08	1½	3.47	1½	1.67	8.89	8	10.56	....	21.38	15.60
2342	2.37	2¼	2.60	2.40	2.15	8.23	8	10.38	10	20.88	19.95
2535	....	....	2.03	2½	1.29	12.40	12.	13.69	13½	14.95	15.10
2217	2.23	2	1.06	1	2.68	8.03	8	10.71	....	19.00	16.60
2388	1.37	....	1.75	....	2.16	7.38	....	9.54	....	14.02	......
2514	2.90	2	1.80	1½	.94	10.61	9	11.55	11½	23.79	19.80
2319	....	....	2.73	2¼	1.15	13.82	13	14.97	15½	17.01	16.25
2509	...	....	1.70	1½	2.16	11.63	12	13.79	*28	14.19	13.90

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2508	Emory & Burgess, Centreville, Md.	Diamond Bone Phosphate.	Centreville
2631	D. Englar, Jr., Medford, Md.	No. 1 Bone Phosphate	Medford
2628	" " "	No. 3 Bone Phosphate	Medford
2619	Englar & Rinehart, Linwood, Md.	No. 1 Ammoniated Bone Phosphate.	Linwood
2621	" " "	No. 2 Ammoniated Bone Phosphate	Linwood
2426	Eureka Fertilizer Co., Perryville, Md.	Alkaline Bone and Potash.	Rowlandsville
2445	" " "	Bone Meal	Rising Sun
2443	" " "	Farmers' Favorite Bone Phosphate.	Rising Sun
2441	" " "	Grain and Grass Mixture	Rising Sun
2526	" " "	Imperial Bone Phosphate	Leslie
2442	" " "	Pure Dissolved Animal Bone.	Rising Sun
2454	" " "	Pure Ground Bone	Perryville
2453	" " "	P. & P. Superphosphate	Perryville
2444	" " "	Raw Bone Phosphate	Rising Sun
2167	W. S. Farmer & Co., Baltimore, Md.	B. & P. Fertilizer	Baltimore
2126	" " " "	Dissolved S. C. Bone	Baltimore
2293	" " " "	Fish Mixture	Baltimore
2456	" " " "	Ground Bone	Aberdeen
2129	" " " "	Pure Bone Meal	Baltimore
2128	" " " "	Standard Phosphate	Baltimore
2189	Farmers' Fertilizer Co., Westminster, Md.	Dissolved S. C. Bone	Westminster

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No.	NITROGEN Calculated as AMMONIA.		POTASH, K$_2$O.		PHOSPHORIC ACID.					Comparative Value per Ton Found.	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.	Insoluble Found.	**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2508	.91	2	1.76	3	2.42	9.61	9	12.03	11.	$17.47	$21.00
2631	2.11	1½	2.43	1½	1.37	9.73	9½	11.10	....	21.26	17.40
2628	1.45	1	2.79	2¾	1.30	9.59	5	10.89	....	19.43	11.75
2619	2.60	2½	1.33	1.24	2.76	11.06	11.31	13.82	....	24.06	22.31
2621	.92	1.80	2.41	1.83	1.62	10.77	11.99	12.39	....	19.06	21.62
2426	......	......	.89	2	4.04	12 12	11	16.16	12	14.63	13.40
2445	3.62	3	......	......	....	....	......	21.83	25	27.96	......
2443	1.96	2	1.53	2	4.06	9.66	10	13.72	12	21.44	21.20
2441	1.39	1	1.78	2	3.96	9.84	9	13.80	10	20.14	16.40
2526	1.39	1	1.16	1	3.73	9.98	9	13.71	10	19.55	15.40
2442	1.96	2	....	....	5.03	10.04	12	15.07	15	20.95	22.20
2454	4.75	4	......	......	....	......	......	22.94	22	29.10	......
2453	......	......	......	......	4.49	12.17	14	16.66	15	12.17	14.00
2444	1.88	2	1.88	2	4.12	9.84	10	13.96	13	21.80	21.80
2167	......	......	2.12	2½	.57	11.46	10.	12.03	11.	13.81	12.90
2126	.....	......	......	......	.93	14.88	14.	15.81	15½	14.88	14.00
2293	2.01	2.	1.69	1½	1.55	9.11	9	10.66	11	19.58	19.50
2456	3.02	3	......	......	......	... .	....	17.36	15.	19.73	......
2129	4.43	4.68	......	......	......	......	......	24.60	25.60	31.95	......
2128	2.72	2.85	2.52	2½	2.06	10.55	10	12.62	11½	24.59	23.95
2189	......	......	.....	... ...	.72	16.24	14	17.16	....	16.24	14.00

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2185	Farmers' Fertilizer Co., Westminster, Md.	No. 1 Bone Phosphate	Westminster
2186	“ “ “	No. 2 Bone Phosphate	Westminster
2187	“ “ “	No. 3 Bone Phosphate	Westminster
2188	“ “ “	X X Bone Phosphate	Westminster
2384	Frederick Elevator Co., Frederick, Md.	Farmers' Friend	Frederick
2561	E. B. Freeman & Co., Norfolk, Va.	Pocomoke Superphosphate.	Pocomoke
2197	N. I. Gorsuch & Son., Westminster, Md.	Westminster Dissolved Bone Phosphate.	Westminster
2155	Griffith & Boyd, Baltimore, Md.	Ammoniated Bone Phosphate.	Baltimore
2156	“ “ “	Ammoniated Soluble Bone.	Baltimore
2330	“ “ “	Cereal Bone Plant Food	Fowblesburg
2220	“ “ “	High Acid Phosphate	Baltimore
2171	“ “ “	Peerless Fertilizer	Canton
2157	“ “ “	Pure Dissolved Animal Bone.	Baltimore
2154	“ “ “	Strictly Pure Raw Bone Meal.	Baltimore
2309	“ “ “	Valley Fertilizer	White Hall
2469	Griffith & Lytle, Baltimore, Md.	Standard Bone Phosphate	Baltimore
2179	Griffith, Turner & Co., Baltimore, Md.	Ammoniated Butchers' Bone Phosphate.	Glyndon
2127	“ “ “ “	Animal Bone Phosphate	Baltimore
2144	“ “ “ “	Dissolved Bone	Baltimore
2180	“ “ “ “	Ground Bone	Glyndon
2178	“ “ “ “	High Grade Acid Phosphate.	Glyndon

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						Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.	Insoluble Found.	**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2185	**2.81**	2½	**2.85**	2½	1.53	**9.46**	9	**10.99**	11	**$23.55**	$22.00
2186	**2.14**	2	**2.36**	2½	1.00	**10.27**	9	**11.27**	10	**21.70**	19.90
2187	**1.87**	1¾	**2.51**	2½	.28	**10.73**	9	**11.01**	11	**21.17**	19.75
2188	**1.29**	1	**3.02**	3	.64	**10.41**	9	**11.05**	10.	**19.73**	17.40
2384	**1.20**	1	**.89**	1	2.47	**9.90**	8	**12.37**	10	**17.85**	14.80
2561	**2.36**	2	**2.58**	2	1.24	**9.38**	8	**10.62**	....	**21.66**	17.60
2197	**1.53**	1.40	**2.35**	2¼	1.60	**7.91**	7	**9.51**	8	**17.39**	15.45
2155	**2.04**	2½	**1.73**	2	1.95	**9.62**	10	**11.57**	11	**20.56**	22.10
2156	**1.48**	1	**1.98**	1½	2.60	**7.93**	7	**10.53**	8	**17.50**	13.50
2330	**1.35**	1	**2.22**	2	2.39	**9.02**	8	**11.41**	9	**18.52**	15.80
2220	....	....	......	....	2.15	**13.16**	14	**15.31**	15.	**13.16**	14.00
2171	....	....	**2.10**	2	2.17	**9.33**	8	**11.50**	9	**12.30**	10.40
2157	**2.16**	2½	......	....	2.79	**11.23**	10	**14.02**	11	**21.63**	20.10
2154	**4.34**	4	......	....	......	......	....	**24.65**	*47	**25.85**	......
2309	**.91**	½	**2.77**	2	1.91	**8.13**	8	**10.04**	9	**16.42**	13.70
2469	**1.78**	2.	**2.33**	1½	1.71	**10.57**	9.	**12.28**	10.	**19.38**	18.90
2179	**1.86**	1½	**1.65**	1½	2.04	**9.23**	9	**11.27**	10	**19.53**	17.40
2127	**2.06**	2½	**1.59**	1½	2.10	**9.69**	10	**11.79**	11.	**20.66**	21.60
2144	**2.04**	2	......	....	3.67	**7.29**	9	**11.96**	10	**17.07**	17.40
2180	**4.78**	4	......	....	......	......	....	**23.00**	*45	**28.81**	......
2178	....	....	......	....	1.58	**13.12**	14.	**14.70**	15	**13.12**	14.00

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2182	Griffith, Turner & Co., Baltimore, Md.	Soft Ground Bone	Glyndon
2181	" " " "	Soluble Bone Phosphate	Glyndon
2195	O. E. Grimes, Westminster, Md.	Bone Phosphate	Westminster
2529	S. M Hess, & Bro., Philadelphia, Pa.	Ground Bone	Leslie
2527	" " "	Keystone Dissolved Bone Phosphate.	Leslie
2297	J. Horner, Jr , & Co , Baltimore, Md.	Ammoniated Raw Bone Superphosphate.	Glencoe
2298	" " "	Dissolved Slaughter House Bone Dust.	Glencoe
2130	" " "	Slaughter House Bone Dust.	Baltimore
2395	Hubbard & Co., Baltimore, Md.	Buyers' Special Mixture	Walkersville
2389	" " "	Columbia Gem Phosphate	Walkersville
2501	" " "	Cresent Soluble Crop Producer.	Greensboro
2142	" " "	High Grade Soluble S. C. Phosphate.	Baltimore
2390	" " "	Oriental Phosphate	Walkersville
2209	" " "	Standard Bone Superphosphate.	Baltimore
2162	" " "	Wheat Growers' Jewel	Baltimore
2451	M. P. Hubbard & Co., Baltimore, Md.	Ammoniated Bone and Potash Phosphate.	Rising Sun
2333	" " " "	Celebrated Bone Superphosphate.	Fowblesburg
2638	" " " "	Farmers' Acme Fertilizer	Glen Morris
2450	" " " "	Farmers' Old Economy	Rising Sun
2334	" " " "	Harvest King for Wheat and Grass.	Fowblesburg
2335	" " " "	High Grade Soluble S. C. Phosphate.	Fowblesburg

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						Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.	Insoluble Found.	**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2182	4.38	4	....	....	3.54	7.64	....	11.18	*25	$24.43	$18.90
2181	....	....	2.02	1½	1.83	9.46	9	11.29	10	12.21	10.90
2195	1.48	1	2.37	2	2.73	7.99	6	10.72	*12	18.04	12.20
2529	2.91	3	....	....	....	....	....	17.94	20	20.45	....
2527	1.23	1	1.51	1	2.48	9.64	9	12.12	*18	18.26	16.00
2297	5.59	2½	3.18	2½	2.28	5.48	8	7.76	*25	27.90	22.00
2298	2.50	2½	....	....	2.68	11.80	12	14.48	*32	23.27	23.70
2130	6.53	6	....	....	....	....	....	20.07	20.	30.62	....
2395	1.24	....	.39	....	2.01	13.34	....	15.35	....	21.38	....
2389	.56	½	1.51	1½	1.21	9.62	8	10.83	10	15.46	13.80
2501	.50	¼	....	....	1.61	11.11	10.	12.72	11	15.80	13.35
2142	....	....	....	....	.98	13.83	14	14.81	*28	13.83	14.00
2390	1.02	1.	1.81	1½	1.04	9.76	8	10.80	10	17.20	15.30
2209	1.93	2	1.91	2	1.45	10.75	9	12.20	10	21.47	19.40
2162	1.72	1½	1.41	1½	.77	11.19	10	11.96	11	20.46	18.60
2451	.97	1	1.95	1½	1.47	7.58	8	9.05	9½	14.84	15.00
2333	2.26	2½	2.82	2	1.31	8.93	9	10.24	10½	21.11	21.20
2638	1.49	2	2.32	2	2.52	8.08	7	10.60	8½	18.00	17.30
2450	.67	½	1.61	1½	1.60	8.55	8	10.15	10	14.84	13.80
2334	1.30	1½	2.09	1½	1.26	9.35	9	10.61	10½	17.96	17.70
2335	....	....	....	....	1.56	14.06	14	15.62	*26	14.06	14.00

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2332	M. P. Hubbard & Co., Baltimore, Md.	Soluble Bone and Potash	Fowblesburg
2490	Leibig Manufacturing Co., For T. R. Hubbard & Son., Chestertown, Md.	Dissolved S. C. Phosphate.	Queen Anne
2491	T. R. Hubbard & Son, Chestertown, Md.	Imperial Compound	Queen Anne
2517	" " "	Our A. A. Bone Superphosphate.	Chestertown
2518	" " "	Victor	Chestertown
2565	R. Humphrey, Salisbury, Md.	Our Mixture "B"	Salisbury
2564	" " "	Our Mixture "F"	Salisbury
2133	Lazaretto Guano Co., Baltimore, Md.	Alkaline Phosphate	Baltimore
2251	" " "	Ammoniated Bone Phosphate.	Chewsville
2134	" " " For Cutshall & Stimmell.	Ammoniated Bone Phosphate.	Baltimore
2606	" " "	Bone Compound	Chewsville
2322	" " "	Crop Grower Especially for Wheat.	Hampstead
2280	" " "	Dissolved Bone	Washington Grove
2135	" " "	Dissolved S. C. Bone	Baltimore
2160	" " "	Forsythe and Linthicum Mixture.	Baltimore
2279	" " "	Harford Bone	Washington Grove
2515	" " "	High Grade Dissolved Bone Phosphate & Potash	Chestertown
2159	" " "	Pure Dissolved S. C. Bone	Libertytown
2603	Lechleider Bros., Hagerstown, Md.	Animal Bone Phosphate.	Hagerstown
2266	" " "	Eagle Bone Phosphate	Hagerstown
2267	" " "	Soluble Bone	Hagerstown

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						Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.	Insoluble Found.	**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2332	....	....	3.35	2	1.31	9.28	9	10.59	11	$13.15	$11.80
2490	....	....	....	....	1.51	13.76	14	15.27	.*27	13.76	14.00
2491	1.31	1	2.27	2½	1.53	10.20	8	11.73	10	18.76	16.30
2517	1.73	1¼	3.22	3	2.33	11.24	9	13.57	11	23.30	18.75
2518	.50	0.2	1.85	3	3.22	9.42	7	12.64	8	16.58	12.60
2565	2.39	3	1.85	1½	2.06	9.70	8	11.76	....	21.89	20.10
2564	2.93	2½	1.60	1	3.33	7.50	7	10.83	8	21.38	17.50
2133	....	....	1.81	2	.81	11.24	11	12.05	....	13.37	13.00
2251	1.21	1	2.10	2	2.22	9.27	9	11.49	....	18.18	15.80
2134	1.16	1	2.01	1	1.12	8.89	8	10.01	....	16.82	13.60
2606	1.29	1¼	2.89	2½	1.26	10.12	10	11.38	....	19.66	18.25
2322	1.90	2	2.03	2	1.37	9.34	10	10.71	....	19.76	20.00
2280	2.28	2	.....	....	.86	10.23	10	11.19	....	19.64	18.00
2135	....	....	....	....	.49	15.75	14	16.24	....	15.75	14.00
2160	2.22	2	2.46	2½	1.18	9.78	9	10.96	14	21.57	22.30
2279	3.18	3	....	....	4.96	11.66	....	16.62	*35	26.51	18.60
2515	....	....	2.08	3.	.46	12.65	12.	13.11	....	14.91	15.00
2159	....	....	....	....	.71	16.23	14	16.94	....	16.23	14.00
2603	.15	1½	.81	½	1.12	4.92	7	6.04	8½	6.18	14.30
2266	.67	1	1.56	1½	1.39	5.72	6	7.11	7	11.26	12.30
2267	.43	2½	1.17	1½	1.25	4.47	6	5.72	6	8.57	16.20

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2265	Lechleider Bros., Hagerstown, Md.	S. C. Bone	Hagerstown
2608	Lister Agricultural Chemical Co., Newark, N. J.	Ammoniated Dissolved Bone.	Chewsville
2336	" " "	Animal Bone and Potash	Fairview
2461	" " "	Celebrated Ground Bone	Elkton
2208	" " "	Harvest Queen Phosphate.	Baltimore
2471	" " "	I Increase Cresent Bone Dust.	Cambridge
2250	" " "	Standard Bone Phosphate	Chewsville
2499	" " "	Special Potato Fertilizer	Greensboro
2373	" " "	Sullivan's Sure Success.	Monrovia
2605	Joseph Lister, Chicago, Ill.	Pure Bone Meal	Chewsville
2183	J. A. Livers, Gettysburg, Pa.	Gold Dust	Westminster
2497	T. H. Longfellow, Greensboro, Md.	Farmers' Delight, No. 1.	Greensboro
2496	" " "	Farmers' Delight, No. 2.	Greensboro
2539	" " "	Farmers' Mixture	Ingleside
2531	Maryland Fertilizing Co., Baltimore, Md.	Alkaline Bone	Port Deposit
2296	" " "	Dissolved Phosphate	Glencoe
2175	" " "	Dissolved S. C. Bone	Baltimore
2407	" " "	Linden Superphosphate	Germantown
2222	" " "	Pure Dissolved Animal Bone.	Baltimore
2214	" " "	Sangston's Cereal and Plant Food.	Baltimore
2468	Maryland Grange Agency, Baltimore, Md.	Agency's Favorite	Baltimore

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						Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.	Insoluble Found.	**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2265	....	....	**1.17**	1¼	.95	**5.32**	6	**6.27**	6	**$ 6.87**	$ 7.25
2608	**2.41**	2¼	**1.89**	1½	3.26	**9.06**	9	**12.32**	11	**21.95**	20.25
2336	....	....	**5.15**	5	1.32	**9.77**	9	**11.09**	10	**15.45**	14.40
2461	**3.87**	3¼	.....	....	5.13	**8.24**	....	**13.37**	12	**24.58**	16.95
2208	**1.91**	1½	**2.50**	2	2.54	**9.59**	9	**12.13**	11	**21.26**	18.50
2471	**3.03**	2¾	.....	....	7.81	**6.19**	....	**14.00**	11	**21.21**	13.35
2250	**3.79**	2.85	**2.24**	1½	2.63	**9.78**	10	**12.41**	12.	**26.93**	23.25
2499	**1.81**	2	**4.10**	3.	1.88	**10.51**	8	**12.39**	....	**23.27**	18.10
2373	**2.18**	2	**1.86**	2	2.70	**9.47**	8	**12.17**	....	**21.38**	17.60
2605	**3.55**	4.68	.....	....	......	....	....	**25.95**	25.60	**30.70**	......
2183	**1.09**	1	**2.04**	1½	1.96	**7.54**	8	**9.50**	10	**15.54**	15.30
2497	**1.03**	1	**2.27**	2	.59	**10.28**	8	**10.87**	9	**18.05**	15.20
2496	**.79**	½	**2.21**	1	1.80	**8.18**	8	**9.98**	9	**15.49**	12.70
2539	**1.18**	1	**2.35**	2	1.49	**11.38**	8	**12.87**	....	**20.44**	14.60
2531	....	....	**5.56**	3¼	1.13	**12.19**	11	**13.32**	....	**18.20**	14.25
2296	....	....	.....	....	.97	**13.88**	13	**14.85**	....	**13.88**	13.00
2175	....	....	.....	....	1.21	**13.76**	13.	**14.97**	14	**13.76**	13.00
2407	....	....	**3.35**	2½	1.50	**11.33**	9¾	**12.83**	....	**15.28**	12.25
2222	**2.69**	2½	.....	....	3.92	**13.56**	12	**17.48**	....	**26.69**	21.90
2214	**1.58**	1¼	**2.07**	2	3.91	**9.15**	10	**13.06**	....	**20.14**	17.75
2468	**2.70**	....	**2.13**	....	3.33	**11.62**	....	**14.95**	....	**26.17**	......

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2161	Maryland Grange Agency, Baltimore, Md.	Dissolved S. C. Bone	Baltimore
2545	" " "	Special Wheat Grower	Pocomoke
2507	Wm. McKenney, Centreville, Md.	McKenney's Compound	Centreville
2488	" " "	No. 1 "D" Wheat Fertilizer.	Hillsboro
2487	" " "	No. 3 Soluble Phosphate	Hillsboro
2268	F. Mehring, Bruceville, Md.	Acid Phosphate	Williamsport
2587	" " " "	Ammoniated No. 2 Superphosphate.	Bruceville
2585	" " " "	Baumgardner's Mixture	Frederick
2588	" " " "	Dissolved Raw Bone	Bruceville
2239	" " " "	Emmert's Half & Half	Bruceville
2586	" " " "	$26 Phosphate	Bruceville
2653	Miller Fertilizer Co., Baltimore, Md.	Acid Fertilizer	Kemptown
2374	" " " "	Bone and Potash	Monrovia
2310	" " " "	Cleremont Phosphate	Greystone
2313	" " " "	Clinch Phosphate	Gorsuch Mills
2347	" " " "	Dissolved Raw Bone	Ellicott City
2158	" " " "	Dissolved S. C. Bone	Balttmore
2343	" " " "	Ground Bone	Ellicott City
2172	" " " "	Harvest Queen	Baltimore
2331	" " " "	Hustler Phosphate	Fowblesburg
2312	" " " "	Pure Bone Meal	Gorsuch Mills

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No.	NITROGEN Calculated as AMMONIA.		POTASH, K_2O.		PHOSPHORIC ACID.					**Comparative Value per Ton Found.**	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.	Insoluble Found.	**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2161	......	......	......	......	.72	15.13	14	15.85	15	$15.13	$14.00
2545	1.37	1¼	2.46	2½	2.41	10.74	10	13.15	11½	20.91	19.15
2507	2.14	1½	1.66	1½	2.78	8.16	10	10.94	......	19.55	18.00
2488	2.43	2	2.17	2½	2.22	8.96	7	11.18	......	21.55	16.90
2487	.12	.30	1.56	3	1.52	12.91	12.13	14.43	......	15.08	18.30
2268	......	......	......	......	2.10	15.01	12.	17.11	......	15.01	12.00
2587	1.55	1	1.62	¾	3.14	11.28	9	14.42	......	21.69	14.55
2585	1.71	1	1.11	1	1.83	12.84	10	14.67	......	22.75	16.00
2588	2.44	1	......	......	1.11	16.77	14	17.88	......	28.11	19.80
2239	2.05	1	......	......	2.11	14.05	12	16.16	......	24.28	17.40
2586	1.58	1	1.14	½	3.41	10.61	9	14.02	......	20.66	14.30
2653	1.31	......	1.29	......	1.85	9.09	......	10.94	......	17.28	......
2374	......	......	2.31	2	1.53	10.16	10	11.69	12	13.18	12.80
2310	......	......	3.14	2½	1.63	10.39	10	12.02	11½	14.18	13.10
2313	1.29	1	2.01	½	2.39	7.54	7	9.93	9	16.35	13.10
2374	2.77	2½	......	......	2.81	10.58	11	13.39	14	22.70	22.50
2158	......	......	......	......	1.02	13.47	14	14.49	*30	13.47	14.00
2343	2.92	3	......	......	......	......	......	15.85	15	19.90	......
2172	1.37	1¼	2.32	2¼	1.40	10.51	10	11.91	11½	19.88	18.90
2331	1.18	1	2.70	2¼	1.58	9.03	9	10.61	10	18.03	16.65
2312	4.15	4	......	......	......	......	......	24.33	20	30.73	......

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2163	Miller Fertilizer Co., Balmore, Md.	Standard Superphosphate.	Baltimore
2166	" " "	Special Wheat Grower	Baltimore
2654	" " "	S. C. Bone	Kemptown
2341	George W. Miller, Baltimore, Md.	Dissolved Bone Phosphate.	Lewistown
2626	" " "	Miller Mixture	Loys
2215	L. Moritz, Philadelphia, Pa.	Bone	Baltimore
2613	Mount Airy Manufacturing Co., Baltimore, Md.	Dissolved Animal Bone	Cumberland
2614	" " " "	Harvest King Ammoniated Bone.	Cumberland
2513	" " " "	Piedmont Dis. Bone Phosphate & Potash Goods	Chestertown
2615	" " " "	Piedmont Pure Raw Bone Meal.	Cumberland
2216	" " " "	Piedmont Pure Raw Bone Mixture.	Baltimore
2612	" " " "	Piedmont Royal Ammoniated Bone and Potash.	Cumberland
2498	" " " "	S. C. Bone Phosphate	Greensboro
2542	" " " "	Star Soluble Bone and Potash.	Baltimore
2295	G. R. Mowell, Glencoe, Md.	Dissolved S. C. Rock	Glencoe
2299	" " " "	Standard Bone Phosphate.	Glencoe
2164	Natural Plant Food Co., Washington, D. C.	Natural Plant Food	Baltimore
2492	Nickerson Fertilizer Co., Easton, Md.	Bone and Potash	Queen Anne
2478	" " "	Eastern Shore Domestic Guano.	Easton
2349	" " "	Linthicum's Special Mixture.	Ellicott City
2493	" " "	Mixture	Queen Anne

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No.	NITROGEN Calculated as AMMONIA.		POTASH, K₂O.		PHOSPHORIC ACID.					Comparative Value per Ton Found.	Comparative Value per Ton Guaranteed.
					Insoluble Found.	Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.		**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2163	3.06	2.80	2.26	2¼	.88	10.94	10	11.82	11½	$25.10	$23.70
2166	2.09	2	2.13	2	1.07	9.21	8	10.28	10	20.09	18.80
2654	....	....	2.15	2¼	2.07	11.58	11	13.65	....	14.56	13.25
2341	....	....	....	....	2.03	13.90	14	15.93	15	13.90	14.00
2626	1.77	2	2.44	2	3.18	9.56	5½	12.74	12	21.13	18.50
2215	4.39	5	....	....	....	....	....	25.66	23	29.74	......
2613	2.55	3½	....	....	2.87	10.44	8	13.31	....	21.90	20.10
2614	1.09	1	2.16	2	.62	11.06	10	11.68	11	19.07	17.60
2513	....	....	1.06	1	2.09	10.61	10	12.70	11	12.51	11.40
2615	4.43	4	....	....	....	....	....	23.56	*45.	25.96	......
2216	1.10	1	.93	1	1.78	7.33	7	9.11	11	14.10	14.80
2612	1.15	1.30	3.03	3.	.83	5.64	6	6.57	8	13.77	15.30
2498	....	....	....	....	.59	13.39	13	13.98	14	13.39	13.00
2542	....	....	1.66	2	1.65	10.35	10	12.00	12	12.67	12.80
2295	....	....	....	....	1.97	12.91	14.	14.88	15.	12.91	14.00
2299	2.07	2	2.26	2	1.79	10.46	10	12.25	11.	22.09	20.60
2164	....	....	....	....	17.70	1.40	....	19.10	*47	8.48	8.64
2492	.54	½	1.76	3	5.26	11.04	7	16.38	8	19.79	13.50
2478	1.73	2	3.61	3	1.85	10.06	9	11.91	11	21.98	21.00
2349	.96	½	2.45	3	4.61	9.49	8	14.10	9	19.49	14.70
2493	.78	½	2.18	3.	4.80	10.31	8	15.11	9	19.77	14.50

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2652	Nickerson Fertilizer Co., Easton, Md.	Mixture	Wye
2455	“ “ “	Pure Ground Bone	Aberdeen
2470	“ “ “	S. C. Phosphate	Cambridge
2477	“ “ “	S. C. Phosphate and Potash.	Easton
2479	“ “ “	Special Mixture	Easton
2416	Northwestern Fertilizer Co., Chicago, Ill.	Horseshoe Brand Ammoniated Dis. Bone.	Fallston
2418	“ “ “	Horseshoe Brand Corn and Tomato Grower.	Bel Air
2650	“ “ “	Horseshoe Brand Fine Raw Bone	Rutledge
2176	“ “ “	Prairie Phosphate	Laurel
2452	“ “ “	Ralston Bone Meal	Rising Sun
2211	G. Ober & Sons, Baltimore, Md.	Dissolved Bone Phosphate.	Baltimore
2578	“ “ “ “	Dissolved Bone Phosphate	Cambridge
2534	“ “ “ “	Dissolved Bone Phosphate and Potash.	Baltimore
2391	“ “ “ “	Farmers' Mixture	Walkersville
2315	“ “ “ “	Farmers' Standard Ammoniated Phosphate.	Bentleys
2406	“ “ “ “	Gassaway's Ammoniated Dissolved Bone.	Germantown
2405	“ “ “ “	Special Ammoniated Dissolved Bone.	Germantown
2506	Patapsco Guano Co., Baltimore, Md.	Baltimore Soluble Phosphate.	Centreville
2318	“ “ “	Dissolved Raw Bone	Cockeysville
2317	“ “ “	Grain & Grass Producer.	Cockeysville
2314	“ “ “	Grange Mixture	Gorsuch Mills

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					Insoluble Found.	Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.		**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2652	.20	½	2.64	3.	2.17	9.35	9	11.52	9	$12.86	$15.90
2455	3.04	3	...	...	...	...	...	23.19	*40	27.29	...
2470	...	...	...	...	3.37	12.61	13	15.98	15	12.61	13.00
2477	...	...	2.50	3	1.63	13.29	9	14.91	11	16.43	12.80
2479	.66	½	2.21	2	4.23	10.52	8	14.75	...	19.35	13.10
2416	2.82	2½	1.18	.54	1.42	9.87	8	11.29	12	22.33	20.04
2418	3.07	2½	.91	.54	1.29	9.11	8	10.40	...	21.82	17.64
2650	4.96	4	...	...	...	...	...	22.14	*48	27.78	...
2176	2.97	2	...	...	2.54	7.19	9	9.73	13	19.06	18.60
2452	4.88	3	...	...	...	...	...	22.52	*30	24.56	...
2211	...	...	0.09	1	.96	15.78	14	16.74	16½	15.78	15.00
2578	...	...	...	...	1.88	15.49	14	17.37	16	15.49	14.00
2534	...	...	2.62	2	.96	12.81	10	13.77	12	15.81	12.80
2391	1.37	1	2.26	1½	.72	10.67	8	11.39	11½	19.60	16.20
2315	2.78	2	1.96	½	2.98	8.47	8	11.45	10½	22.30	17.60
2406	2.86	2½	3.58	3.	1.55	10.23	9	11.78	11	25.37	22.50
2405	1.77	1½	2.49	1½	2.15	9.82	8	11.97	10½	20.87	17.10
2506	...	...	2.09	1½	.94	11.85	10	12.79	12	14.31	12.30
2318	2.41	2	...	...	1.32	12.29	12	13.61	13	22.77	21.00
2317	1.21	1	3.33	2	1.23	9.74	10	10.97	12.	19.38	18.20
2314	2.04	2	3.00	1½	1.59	9.84	10	11.43	12½	21.87	21.00

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2145	Patapsco Guano Co., Baltimore, Md.	Pure S. C. Bone	Baltimore
2651	" " "	Pure Dissolved S. C. Bone.	Carmichael
2316	" " "	Special Wheat Compound Am. Superphos.	Cockeysville
2489	Philadelphia and Smyrna Tranporation Co., Phila.	Quality and Quantity Superphosphate.	Queen Anne
2510	" " "	Soluble Bone and Potash.	Centreville
2575	Wm. A. Pleasant, Baltimore, Md.	Harvest Queen	Cambridge
2576	" " "	High Grade Acid Phosphate.	Cambridge
2505	" " "	High Grade Wheat Fert. for Wheat and Grass.	Centreville
2301	" " "	Pure Dissolved Bone	Glencoe
2292	R. H. Pollock, Baltimore, Md.	Ammoniated Bone Phosphate.	Baltimore
2291	" " "	Dissolved Animal Bone.	Baltimore
2290	" " "	Dissolved S. C. Bone	Baltimore
2289	" " "	Ground Animal Bone	Baltimore
2401	" " "	Soluble Bone Phosphate.	Woodsboro
2657	" " "	S. C. Rock	Ridgeley
2165	" " "	Special Wheat Grower	Baltimore
2147	Powell Fertilizer & Chemical Co., Baltimore, Md.	Dissolved S. C. Bone	Baltimore
2287	" " "	Green Bag for Wheat	Baltimore
2146	" " "	Hard Times Fertilizer	Baltimore
2577	" " "	Red Bag	Cambridge
2278	Ramsburg Fertilizer Co., Frederick, Md.	Ammoniated Bone	Washington Grove

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						Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.	Insoluble Found.	**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2145	....	....	..	....	1.74	14.44	14	16.28	....	$14.44	$14.00
2651	.....	....	.....	....	1.02	15.70	14	16.72	....	15.70	14.00
2316	2.27	2	3.02	3	1.05	10.09	10	11.14	13	22.57	21.80
2489	1.43	1½	3.58	2½	2.83	7.80	8	10.63	....	18.93	16.60
2510	....	....	2.83	3	2.38	9.36	10	11.74	....	13.14	13.00
2575	1.84	1½	2.38	2½	1.61	10.04	10	11.65	11½	20.92	19.90
2576	.....	....	....	....	1.55	14.58	14	16.13	15	14.58	14.00
2505	2.30	2	4.38	4	2.28	10.44	8	12.72	*18	25.18	19.60
2301	2.68	2	......	....	6.28	10.92	15	17.20	*32	24.91	24.00
2292	2.03	2	2.18	2	1.62	8.89	10	10.51	11.	19.91	20.60
2291	2.52	2¼	......	....	2.90	12.25	12	15.15	*25	24.00	21.15
2290	....	....	......	....	1.36	14.51	14	15.87	16.00	14.51	14.00
2289	4.01	4	......	....	......	......	....	25.87	22	27.88	......
2401	....	....	1.90	2	.71	11.23	11	11.94	12	13.41	13.40
2657	.....	....	......	....	1.47	15.17	14	16.64	....	15.17	14.00
2165	1.15	1	3.05	2	1.16	8.61	9	9.77	10	17.53	16.40
2147	....	....	......	....	1.45	13.02	13.	14.47	15	13.02	13.00
2287	3.46	....	4.86	4	2.20	6.52	8	8.72	....	24.39	......
2146	1.36	1¼	2.47	2½	1.13	7.18	7	8.31	8	15.85	15.25
2577	2.01	2	2.05	2	2.47	8.72	8	11.19	....	20.02	17.60
2278	.53	1	1.08	1	3.29	11.42	8	14.71	11	18.24	15.40

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2536	Ramsburg Fertilizer Co., Frederick, Md.	Ammoniated Bone	Mount Carmel
2323	“ “ “	Dissolved Animal Bone	Hampstead
2277	“ “ “	Dissolved Bone Superphosphate.	Hancock
2274	“ “ “	Excelsior Plant Food	Hancock
2380	“ “ “	Half-and-Half	Frederick
2275	“ “ “	Mixture for Wheat	Hancock
2276	“ “ “	Old Virginia Compound	Hancock
2324	Rasin Fertilizer Co., Baltimore, Md.	Acid Phosphate	Hampstead
2364	“ “ “ “	Ammoniated Alkaline Phosphate.	Sykesville
2339	“ “ “ “	Bone and Potash	Baltimore
2363	“ “ “ “	Bone and Potash	Sykesville
2281	“ “ “ “	Dissolved Bone	Gaithersburg
2415	Henry Record Manufacturing Co., Bel Air.	Animal Bone Phosphate	Fallston
2413	“ “ “ “	Dissolved S. C. Bone	Fallston
2420	“ “ “ “	Fine Ground Bone	Bel Air
2414	“ “ “ “	Raw Bone	Fallston
2421	“ “ “ “	Raw Bone	Bel Air
2219	“ “ “ “	Special Compound	Baltimore
2423	J. S. Reese & Co., Baltimore, Md.	Challenge Crop Grower	Cambria
2422	“ “ “ “	Excellenza Soluble Guano.	Cambrica
2177	“ “ “ “	Mayflower	Owings Mills

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					Insoluble Found.	Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.		**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2536	**.61**	1	**1.70**	1	3.17	**11.77**	8	**14.94**	11	**$19.55**	$15.40
2323	**1.86**	2	.....	....	4.64	**11.92**	10	**16.56**	14	**22.66**	20.40
2277	....	....	......	....	.81	**14.93**	14	**15.74**	16	**14.93**	14.00
2274	**2.72**	2	**.82**	1	4.37	**9.03**	9	**13.40**	11.	**22.44**	19.00
2380	**1.40**	1	**2.04**	1	3.56	**9.78**	10	**13.34**	12.	**20.12**	17.20
2275	......	......	**1.90**	2	3.71	**9.17**	10	**12.88**	12.	**12.55**	12.80
2276	**1.90**	1	**1.20**	2	3.45	**10.09**	8	**13.54**	10	**21.08**	15.80
2324	....	....	.....	......	.68	**16.12**	14	**16.80**	15	**16.12**	14.00
2364	**2.55**	....	**1.29**	1¼	2.66	**8.01**	8	**10.69**	9	**18.01**	9.65
2339	....	....	**1.92**	1¼	1.37	**12.38**	12	**13.75**	13	**14.84**	13.65
2363	......	......	**1.18**	2	2.06	**11.86**	10	**13.92**	11	**13.86**	12.40
2281	**2.61**	2	....	....	3.07	**10.05**	10	**13.12**	12	**21.73**	19.20
2415	**1.13**	1	**3.45**	1½	.96	**8.79**	8	**9.75**	*17	**17.97**	14.10
2413	....	....	......	......	.73	**15.22**	12	**15.95**	....	**15.22**	12.00
2420	**2.87**	3.68	......	......	......	......	......	**18.53**	*43.35	**18.07**	......
2414	**5.18**	4.03	....	....	.....	....	....	**19.61**	20.01	**23.60**	......
2421	**5.13**	3.	......	......	.....	......	....	**19.75**	20.00	**24.22**	......
2219	**2.06**	2.03	**2.14**	2.13	1.54	**9.48**	10.66	**11.02**	13.18	**20.62**	22.52
2423	**1.30**	1	**2.24**	2	1.95	**9.12**	8	**11.07**	10	**18.25**	15.80
2422	**2.29**	2¼	**1.40**	1.20	2.04	**10.00**	8½	**12.04**	10½	**21.49**	19.30
2177	**2.28**	2¼	**2.39**	2¼	1.74	**8.73**	8	**10.47**	9½	**20.75**	19.50

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2460	J. S. Reese & Co., Baltimore, Md.	Pilgrim Fertilizer	Aberdeen
2305	“ “ “ “	Standard Fertilizer	Parkton
2387	Reindollar & Co., Taneytown, Md.	Special Mixture	Taneytown
2236	Rinehart & Clemson, Union Bridge, Md.	No. 2 Bone Phosphate	Union Bridge
2589	“ “ “ “	No. 3 Bone Phosphate	Union Bridge
2633	H. S. Roberts & Co , Westminster, Md.	Big Gun	Westminster
2192	“ “ “ “	Dissolved S. C. Bone	Westminster
2632	“ “ “ “	Governor	Westminster
2636	“ “ “ “	Ground Bone	Westminster
2193	“ “ “ “	Leader	Westminster
2191	“ “ “ “	Pride	Westminster
2635	“ “ “ “	Super	Westminster
2194	“ “ “ “	Super “A”	Westminster
2573	E. C. Ross, Seaford, Del.	High Grade Acid Phosphate.	East New Market
2639	“ “ “ “	Rock and Kainit	Reid's Grove
2640	“ “ “ “	Rock, Kainit and Nitrate of Soda.	Reid's Grove
2448	Scott Fertilizer Co., Elkton, Md.	Pure Dissolved Animal Bone.	Rising Sun
2446	“ “ “ “	Pure Ground Bone	Rising Sun
2522	“ “ “ “	Special Wheat and Grass Mixture.	Elkton
2463	“ “ “ “	Standard Phosphate	Elkton
2449	“ “ “ “	Sure Growth Superphosphate.	Rising Sun

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No.	NITROGEN Calculated as AMMONIA.		POTASH, K_2O.		PHOSPHORIC ACID.					Comparative Value per Ton Found.	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.	Insoluble Found.	**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2460	**1.66**	1½	**3.28**	3	1.39	**7.97**	6½	**9.36**	7½	**$18.65**	$15.90
2305	**2.61**	.3	**2.50**	2	1.12	**10.46**	9	**11.58**	10	**23.55**	22.40
2387	**1.60**	1	**1.89**	½	1.40	**6.75**	7	**8.15**	....	**15.63**	11.90
2236	**1.55**	1½	**2.38**	2½	2.02	**8.27**	7	**10.29**	10	**18.26**	17.20
2589	**.61**	¾	**3.21**	3	1.47	**8.09**	6	**9.56**	......	**15.63**	13.65
2633	**2.12**	2	**2.09**	2	1.66	**10.36**	10	**12.02**	*20	**21.88**	20.00
2192	....	......	....	....	1.88	**12.53**	13	**14.41**	15	**12.53**	13.00
2632	**1.24**	1½	**2.44**	2½	1.05	**9.66**	9	**11.71**	10	**18.38**	18.40
2636	**3.85**	3½	....	....	....	......	......	**25.96**	*50	**26.22**	......
2193	**1.16**	1	**1.19**	1½	1.32	**9.50**	8	**10.82**	*18	**16.86**	14.10
2191	**2.58**	2½	**2.24**	2	1.72	**12.27**	11	**13.99**	13	**25.73**	23.90
2635	....	......	**.68**	¾	.83	**12.01**	11	**12.84**	13	**13.02**	12.55
2194	**.82**	¾	**2.48**	1	1.36	**8.32**	7½	**9.68**	8½	**15.74**	12.25
2573	....	....	....	....	2.97	**13.23**	13	**16.20**	14	**13.23**	13.00
2639	....	....	**3.51**	....	1.20	**8.81**	....	**10.01**	....	**12.80**	.....
2640	**1.16**	....	**2.23**	....	1.54	**9.27**	....	**10.81**	....	**17,75**	.....
2448	**2.50**	2½	....	....	2.37	**10.29**	13	**12.66**	16	**21.27**	24.90
2446	**5.00**	4	....	....	....	......	......	**23.34**	22	**26.17**	... ..
2522	**.91**	1	**1.94**	2½	1.38	**10.59**	10	**11.97**	....	**18.21**	17.50
2463	**1.60**	1½	**2.02**	2	1.89	**10.76**	8	**12.65**	....	**20.86**	16.10
2449	**2.28**	2	**2.79**	2	2.25	**9.51**	9	**11.76**	....	**22.39**	18.80

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2465	Scott Fertilizer Co., Elkton, Md.	Tip Top Soluble Bone	Elkton
2464	" " "	Tip Top Soluble Bone and Potash.	Elkton
2357	Sharpless & Carpenter, Philadelphia, Pa.	Cabbage Guano	Ellicott City
2457	" " "	Dissolved Bone Phosphate.	Aberdeen
2359	" " "	Gilt Edge Potato Manure	Ellicott City
2360	" " "	New Rival	Ellicott City
2358	" " "	No. 1 Bone Phosphate	Ellicott City
2362	" " "	Potato Fertilizer	Ellicott City
2361	" " "	Pure Dissolved Bone	Ellicott City
2400	D. A. Sharretts, York Road, Md.	Ammoniated Superphosphate.	Woodsboro
2399	" " "	Bone Phosphate	Woodsboro
2530	G. W. Sharretts & Co., Baltimore, Md.	Ammoniated Bone	Port Deposit
2150	" " "	Fish, Rock and Potash	Baltimore
2557	M. L. Shoemaker & Co.. Philadelphia, Pa.	Dissolved S. C. Rock	Princess Anne
2173	" " " "	Echo Superphosphate	Baltimore
2555	" " " "	Pure Raw Bone Meal	Princess Anne
2556	" " " "	Swift and Sure Bone Meal	Princess Anne
2174	" " " "	Twenty-three Dollar Superphosphate.	Baltimore
2263	J. D. Simmons, Hagerstown, Md.	Honest Fertilizer	Hagerstown
2602	" " "	Wheat and Clover Producer.	Hagerstown
2272	Slingluff & Co., Baltimore, Md.	Ammoniated Bone	Hancock

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No.	NITROGEN Calculated as AMMONIA.		POTASH, K_2O.		PHOSPHORIC ACID.					**Comparative Value per Ton Found.**	Comparative Value per Ton Guaranteed.
					Insoluble Found.	Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.		**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2465	.....	.....	.....	.....	1.07	**13.87**	13	**14.94**	.....	**$13.87**	$13.00
2464	.....	.....	**1.90**	2	.60	**13.94**	11	**14.54**	.....	**16.08**	13.00
2357	**2.39**	2	**2.47**	2	3.99	**8.24**	8	**12.23**	.....	**21.92**	17.60
2457	**2.13**	2	**2.48**	2	3.07	**7.75**	8	**10.82**	.....	**20.01**	17.60
2459	**2.69**	3	**6.21**	5	1.82	**7.34**	6	**9.16**	.....	**24.22**	21.30
2360	**1.10**	1	**1.64**	1	4.48	**5.65**	6	**10.13**	.....	**14.41**	11.20
2358	**1.85**	1½	**2.23**	2	1.74	**9.50**	8	**11.24**	.....	**20.22**	16.10
2362	**1.77**	1½	**1.68**	2	4.51	**8.93**	8	**13.44**	.....	**20.42**	16.10
2361	**2.61**	2	.....	.....	4.01	**11.85**	12	**15.86**	.....	**24.45**	20.40
2400	**1.43**	1	**1.19**	1	.80	**10.52**	9	**11.32**	.....	**18.58**	14.80
2399	**2.17**	2	**1.68**	1	2.66	**8.73**	8	**11.39**	.....	**20.27**	16.60
2530	**.63**	½	**1.31**	1	1.44	**5.71**	5	**7.15**	6	**10.91**	9.10
2150	**.41**	¼	**.65**	½	1.18	**4.75**	5	**5.93**	6	**8.29**	7.85
2557	.....	.....	.....	.....	4.81	**10.37**	12	**15.18**	14	**10.37**	12.00
2173	**1.73**	1	**2.27**	1¼	5.66	**8.20**	7	**13.86**	9	**20.70**	13.85
2555	**5.31**	3	.....	.....	.....	.....	.....	**22.87**	*45	**30.65**	.....
2556	**7.16**	5	.....	.....	.....	.....	.....	**21.93**	*45	**37.74**	.....
2174	**1.54**	1	**1.97**	1	6.08	**7.36**	6	**13.44**	8	**19.07**	12.40
2263	**1.13**	1½	**4.89**	4¼	2.49	**11.02**	12	**13.51**	.....	**22.99**	23.15
2602	**2.18**	2	**6.43**	6	3.34	**11.19**	14	**14.53**	.....	**28.40**	28.80
2272	**2.68**	2½	**2.53**	2½	2.40	**9.67**	9	**12.07**	.....	**23.61**	20.80

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2637	Slingluff & Co., Baltimore, Md.	Baltimore Dissolved Bone	Westminster
2580	" " "	Bone and Potash	Marriottsville
2584	" " "	Dissolved S. C. Bone	Mt. Airy
2630	" " "	Pure Raw Bone Dissolved	New Windsor
2627	" " "	Universal Guano	Rock Ridge
2151	J. M. Smith, Woodsboro, Md.	Ammoniated Bone Superphosphate.	Baltimore
2152	" " "	Dissolved Bone Phosphate.	Baltimore
2153	" " "	Dissolved S. C. Bone	Baltimore
2370	" " "	Monogram Ammoniated Bone.	Mt. Airy
2484	Geo. W. Spurry, Denton, Md.	Special Wheat Manure	Ridgely
2622	G. W. Stocksdale, Thurmont, Md.	Ammoniated Superphosphate.	Thurmont
2623	" " "	Dissolved Animal Bone Phosphate.	Thurmont
2598	J. W. Stonebraker & Son, Hagerstown, Md.	Bone Meal	Hagerstown
2597	" " "	Dissolved Bone	Hagerstown
2594	" " "	Dissolved Bone Phosphate.	Hagerstown
2596	" " "	Standard Dissolved Bone	Hagerstown
2184	Joseph A. Stouffer, New Windsor, Md.	Butcher House Phosphate	New Windsor
2232	" " " "	Maynard's No. 1 Animal Bone.	New Windsor
2629	" " " "	Soluble Wheat Grower	New Windsor
2170	Susquehanna Fertilizer Co. Baltimore, Md.	Ammoniated Bone Phosphate.	Canton
2328	" " "	Burke's Animal Bone Phosphate.	Arcadia

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No.	NITROGEN Calculated as AMMONIA.		POTASH, K_2O.		PHOSPHORIC ACID.					**Comparative Value per Ton Found.**	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.	Insoluble Found.	**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2637	**1.25**	1	**1.15**	1	1.11	**12.84**	10	**13.95**	....	**$21.01**	$16.00
2580	....	....	**2.07**	2	1.10	**10.64**	10	**11.74**	....	**13.15**	12.00
2584	....	....	....	....	1.05	**15.06**	14	**16.11**	....	**15.06**	14.00
2630	**2.77**	2½	....	....	3.32	**11.43**	11	**14.75**	*30	**24.02**	22.50
2627	**1.09**	1	**2.15**	2	1.53	**9.88**	9	**11.41**	....	**18.20**	15.80
2151	**1.61**	1½	**1.01**	1	1.71	**9.55**	9	**11.26**	*24	**18.33**	17.50
2152	....	....	....	....	.57	**14.58**	14	**15.15**	14¾	**14.58**	14.00
2153	....	....	....	....	1.04	**14.25**	14	**15.29**	....	**14.25**	14.00
2370	**1.07**	1	**1.04**	1	2.81	**8.98**	8	**11.79**	*20	**16.72**	14.20
2484	.....	....	**2.64**	2	1.29	**12.77**	9	**14.06**	*20	**15.92**	11.40
2622	**1.02**	¾	**1.86**	2¼	1.21	**8.45**	8	**9.66**	....	**15.79**	14.10
2623	**1.22**	1	**1.50**	2¼	1.91	**8.57**	8	**10.48**	....	**16.59**	14.85
2598	**5.03**	4	....	....	.....	.....	....	**23.16**	*42	**29.47**	......
2597	**2.46**	2	....	....	7.71	**9.10**	11	**16.81**	16	**22.93**	22.20
2594	**1.49**	1	**2.09**	2	4.42	**10.07**	9	**14.49**	12	**21.29**	17.60
2596	**2.01**	2	....	....	8.12	**10.98**	10	**19.10**	14	**24.08**	20.40
2184	**1.23**	¾	**3.23**	2½	1.05	**9.10**	8	**10.15**	9	**18.47**	14.95
2232	**1.55**	1	**6.37**	3	1.79	**8.99**	7½	**10.78**	....	**22.95**	15.00
2629	**.95**	¼	**3.26**	3	1.41	**8.91**	7½	**10.32**	9½	**17.65**	13.95
2170	**1.76**	1½	**1.55**	1½	3.25	**10.92**	9	**14.17**	11	**21.88**	18.00
2328	**1.51**	2	**2.29**	2	1.83	**9.87**	7	**11.70**	*15	**19.76**	16.40

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2591	Susquehanna Fertilizer Co. Baltimore, Md.	Dissolved Bone	Union Bridge
2593	" " " "	Ground Bone	Union Bridge
2221	" " " "	Pure Bone Phosphate	Baltimore
2659	" " " "	Pure Raw Bone	Cambria
2169	" " " "	Superior Rock Phosphate	Baltimore
2592	" " " "	X X V Phosphate	Union Bridge
2610	Swift & Co., Chicago, Ill.	Ground Steamed Bone	Oakland
2609	" " " "	Raw Bone Meal	Oakland
2355	Talbott & Clark, Ellicott City, Md.	Ammoniated Bone Phosphate.	Ellicott City
2356	" " "	Special Potato Manure	Ellicott City
2600	D. A. Thomas, Hagerstown, Md.	Bone Mixture	Hagerstown
2255	" " "	Dissolved Bone	Hagerstown
2599	" " "	Farmers' Mixture	Hagerstown
2258	" " "	Fine Raw Bone	Hagerstown
2256	" " "	Pure Dissolved S. C. Bone	Hagerstown
2398	I. P. Thomas & Sons, Philadelphia, Pa.	Improved Superphosphate.	Woodsboro
2273	" " " "	S. C. Phosphate	Hancock
2548	William B. Tilghman Co., Salisbury, Md.	Bone and Tankage Mixture for Wheat & Grass	Westover
2563	" " " ,,	Fish Mixture	Salisbury
2503	Walter Todd, Baltimore, Md.	No. 1 Standard Bone Phosphate.	Denton
2504	" " "	Rock and Potash Phosphate for Wheat.	Denton

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No.	NITROGEN Calculated as AMMONIA.		POTASH, K_2O.		PHOSPHORIC ACID.					Comparative Value per Ton Found.	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.	Insoluble Found.	**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2591	**2.41**	2	.....	....	6.49	**10.92**	15.	**17.41**	*32	**$24.22**	$24.00
2593	**4.96**	4	.....	....	.....	.....	.....	**21.95**	20	**26.73**	......
2221	**2.08**	2	**2.82**	1½	6.67	**9.78**	9	**16.45**	11	**24.80**	19.50
2659	**4.55**	3	.....	....	.....	.....	.....	**21.78**	15	**23.19**	......
2169	.....	....	.....	....	1.37	**14.10**	14	**15.47**	15	**14.10**	14.00
2592	**.98**	1	**1.52**	1	1.58	**8.83**	8	**10.41**	10	**16.01**	14.80
2610	**3.95**	4	.....	....	.....	.....	.....	**24.92**	23¾	**28.72**	......
2609	**4.64**	4½	.....	....	.....	.....	.....	**24.95**	23.	**28.62**	......
2355	**2.61**	2	**2.16**	2	3.41	**9.35**	9	**12.76**	14	**23.26**	21.80
2356	**2.30**	3	**5.20**	5	2.46	**10.56**	9	**13.02**	10.	**26.25**	25.40
2600	**1.31**	1¼	**2.72**	2	1.08	**11.05**	10	**12.13**	....	**20.56**	17.75
2255	**2.42**	2½	**1.40**	1½	2.10	**9.91**	10	**12.01**	....	**21.71**	21.00
2599	**1.09**	¾	**2.04**	1½	1.39	**12.57**	8	**13.96**	....	**21.22**	13.35
2258	**4.59**	4	...	....	...	.....	......	**22.90**	22	**27.23**	......
2256	.....	....	.....	....	1.56	**13.69**	14	**15.25**	....	**13.69**	14.00
2398	**1.03**	½	**1.82**	½	3.25	**8.92**	10	**12.17**	11	**17.57**	14.60
2273	.....	....	.....	....	2.33	**14.38**	13	**16.71**	15	**14.38**	13.00
2548	**3.61**	3	**1.21**	1	3.33	**9.00**	8	**12.33**	....	**24.84**	19.60
2563	**3.53**	3	**1.33**	1	3.24	**7.48**	7	**10.72**	....	**22.84**	18.40
2503	**1.21**	1½	**2.39**	2	1.22	**9.65**	10	**10.87**	12	**18.33**	19.10
2504	.....	....	**2.31**	2	.64	**11.65**	10	**12.29**	11.	**14.22**	12.40

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2566	Truitt & Co , Salisbury, Md.	Fish Mixture XX	Salisbury
2551	Tygert-Allen Co., Philadelphia, Pa.	Dissolved S. C. Phosphate.	Westover
2558	" " " "	Allen's Soluble Bone and Potash.	Pocomoke
2560	" " " "	Clogg's Soluble Bone and Potash.	Pocomoke
2552	" " " "	High Grade Dissolved S. C. Bone.	Westover
2554	" " " "	Pure Dissolved Bone	Princess Anne
2553	" " " "	Standard Bone Phosphate	Westover
2459	" " " "	Star Bone Phosphate	Elkton
2549	" " " "	Star Bone Phosphate	Westover
2550	" " " "	Star Pure Ground Bone	Westover
2375	J. Tyson & Son, Frederick, Md.	Ammoniated Superphosphate of Lime.	Monrovia
2294	" " "	Dissolved South Carolina	Canton
2378	" " "	Half-and-Half Superphosphate.	Frederick
2351	Joshua Walker, Baltimore, Md.	Dissolved S. C. Phosphate.	Ellicott City
2365	W. H. D. Warfield, Sykesville, Md.	Dissolved Ammoniated Bone.	Sykesville
2574	Webster & Sons, Cambridge, Md.	Acidulated Bone	Cambridge
2474	" " "	No. 2 Ammoniated Bone Phosphate.	Cambridge
2475	" " "	No. 1 Ammoniated Bone Phosphate.	Cambridge
2472	" " "	Poudrette Mixture	Cambridge
2473	" " "	Special Wheat Grower	Cambridge
2476	" " "	The Times Bone Phosphate.	Cambridge

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No	NITROGEN Calculated as AMMONIA.		POTASH, K_2O.		PHOSPHORIC ACID.					Comparative Value per Ton Found.	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	Found.	Guaranteed.	Insoluble Found.	Found.	Guaranteed.	Found.	Guaranteed.		
2566	2.43	2½	2.19	1.48	1.39	7.51	5.32	8.90	8.83	$19.32	$17.47
2551	......	......	......	......	2.23	14.00	12	16.23	13	14.00	12.00
2558	......	......	2.27	2	2.17	10.23	10	12.40	11	13.37	12.40
2560	......	......	1.61	1	2.49	10.27	10	12.76	12	12.86	11.80
2552	......	......	......	......	2.09	14.43	14	16.52	15.	14.43	14.00
2554	3.28	2	......	......	2.65	13.22	10	15.87	......	27.29	18.00
2553	2.20	2	2.29	2	2.07	9.00	8	11.07	......	20.93	17.60
2459	2.60	2½	3.15	2½	3.28	8.70	8½	11.98	10½	23.47	20.65
2549	2.68	2½	2.72	2½	2.58	9.47	8½	12.05	10½	23.67	20.65
2550	3.88	4	......	......	......	......	......	20.09	21	24.98	......
2375	1.24	2	.22	1	2.70	10.09	7	12.79	......	17.67	15.40
2294	......	......	......	......	1.55	14.03	14	15.58	......	14.03	14.00
2378	.83	½	.17	1	1.98	11.10	8	13.08	......	17.00	12.10
2351	......	......	......	......	.28	14.84	14	15.12	15	14.84	14.00
2365	2.64	2	......	......	2.65	10.74	10	13.39	12	22.40	19.20
2574	......	......	......	......	3.08	12.48	11.23	15.56	15.68	12.48	11.23
2474	2.75	2.50	3.22	2.50	1.40	7.98	7.48	9.38	9.53	21.89	20.21
2475	3.52	3	4.39	5	4.31	6.95	10	11.26	*22	25.86	26.00
2472	.55	.51	3.18	3.01	1.66	6.68	6½	8.34	7.62	13.88	13.01
2473	2.79	2½	2.96	2½	1.70	8.03	7	9.73	*14	21.99	18.40
2476	.32	½	2.55	2½	.81	9.65	9	10.46	9.65	15.58	15.19

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2462	M. E. Wheeler & Co., New York, N. Y.	Royal Wheat Grower	Elkton
2482	Williams & Clark Fertilizer Co., New York, N.Y.	Acorn Brand Acid Phosphate.	Ridgeley
2485	“ “ “ “	Dissolved Bone Black	Ridgeley
2481	“ “ “ “	Dissolved Bone and Potash (Americus Brand).	Ridgeley
2486	“ “ “ “	High Grade Special	Ridgeley
2494	“ “ “ “	Queen Anne Compound	Queen Anne
2656	“ “ “ “	S. C. Rock and Potash	Ridgeley
2495	“ “ “ “	Special Formula	Queen Anne
2483	“ “ “ “	Special Formula No. 1	Ridgeley
2480	“ “ “ “	Special Formula No. 2	Ridgeley
2337	Wooldridge Fertilizer and Chem. Co., Balto., Md.	Bone and Potash Mixture	Baltimore
2425	“ “ “	Chicago Bone Meal	Conowingo
2348	“ “ “	Kangaroo Komplete Kompound.	Ellicott City
2285	“ “ “	Orchilla Guano	Gaithersburg
2466	“ “ “	Pure Raw Bone	Baltimore
2307	“ “ “	Pure Dissolved Animal Bone.	White Hall
2131	“ “ “	Sockless and Shoeless	Baltimore
2338	“ “ “	XXTRA Acid Phosphate	Baltimore
2199	Zell Guano Co., Baltimore, Md.	Economizer	Westminster
2203	“ “ “ “	Pure Dissolved Animal Bone.	Westminster

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						Available.		Total.			
	Found.	Guaranteed.	Found.	Guaranteed.	Insoluble Found.	Found.	Guaranteed.	Found.	Guaranteed.		
2462	1.69	1	2.00	2	2.42	8.72	8	11.14	9	$18.98	$15.20
2482	....	....	....	....	.75	14.47	12	15.22	13	14.47	12.00
2485	....	....	....	....	2.57	15.56	15	18.13	....	15.56	15.00
2481	....	....	2.91	2	1.95	11.29	10	13.24	11	14.98	12.40
2486	4.33	4½	7.32	7	2.52	7.89	7	10.41	10	31.29	29.50
2494	1.64	1½	2.15	2.10	2.89	8.69	7½	11.58	9.25	19.23	16 65
2656	...	....	1.81	2	1.98	10.98	10	12.96	11	13.58	12.40
2495	2.29	2	3.44	3¾	1.88	8.88	7½	10.76	....	22.10	18.75
2483	2.23	2	1.88	2	3.84	9.26	8	13.10	....	21.98	17.60
2480	1.49	1	2.14	2	1.71	7.42	7	9.13	....	16.54	13.40
2337	....	....	2.56	2¼	3.13	10.52	8	13.65	11	14.33	11.45
2425	1.81	2½	....	....	....	....	....	19.04	14	21.22	....
2348	2.25	3	2.02	2	2.71	9.36	8	12.07	10	21.63	21.80
2285	....	....	....	....	9.98	4.73	....	14.71	14	8.72	5.60
2466	4.27	4	....	....	....	....	....	22.03	20	30.05	....
2307	2.60	2½	....	....	6.79	11.35	12	18.14	*26	25.49	21.90
2131	1.47	1½	1.47	1¼	3.01	10.64	8	13.65	11	20.46	16.40
2338	....	....	....	....	1.29	15.22	14	16.51	*30	15.22	14.00
2199	1.36	1	1.24	1	1.44	11.76	9	13.20	11	20.31	16.00
2203	2.03	2	....	....	.25	16.67	14	16.92	16	26.24	24.00

*Bone Phosphate. Divide by 2.18 to reduce to Phosphoric Acid.

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Table Showing the Mechanical Analysis of Ground Bone.

(*The Chemical Analysis is Given in Preceding Table.*)

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Fine, Less than 1-50 inch.	Fine-Medium, 1-25 to 1-50 inch.	Medium, 1-12 to 1-25 inch.	Coarse, Larger than 1-12 inch.
2132	Baugh & Sons Co., Baltimore, Md.	Bone Meal, Warranted Pure..	41	35	24	0
2458	Baker & Morgan, Aberdeen, Md.	Pure Raw Bone Meal,	21	47	32	0
2647	Charles E. Bond, Spencerville, Md.	Pure Bone Dust	6	34	29	31
2210	John Bullock & Son, Baltimore, Md.	Pure Ground Raw Bone	35	25	25	15
2528	R. L. Christie & Co., Baltimore, Md.	Pure Ground Bone	19	21	40	20
2433	E. A. Clendennin & Bro., Colora, Md.	Pure Ground Bone	21	23	30	26
2524	J. A. Cranston Co., Newport, Del.	Ground Raw Bone	16	22	22	40
2137	Detrick Fertilizer and Chemical Co., Baltimore, Md.	Pure Fine Ground Animal Bone.	52	30	18	0
2445	Eureka Fertilizer Co., Perryville, Md.	Bone Meal	42	47	11	0
2454	" " " "	Pure Ground Rone	30	30	40	0
2456	W. S. Farmer & Co., Baltimore, Md.	Ground Bone	22	38	27	13
2129	" " " "	Pure Bone Meal	49	25	26	0
2154	Griffith & Boyd, Baltimore, Md.	Strictly Pure Raw Bone Meal.	26	24	50	0
2180	Griffith, Turner & Co., Baltimore, Md.	Ground Bone	31	30	31	8
2529	S. M. Hess & Bro., Philadelphia, Pa.	Ground Bone	20	43	37	0
2130	J. Horner, Jr , & Co., Baltimore, Md.	Slaughter House Bone Dust	24	35	41	0
2605	Joseph Lister, Chicago, Ill.	Pure Bone Meal	46	29	25	0
2343	Miller Fertilizer Co., Baltimore, Md.	Ground Bone	40	35	15	10
2312	" " " "	Pure Bone Meal	40	40	20	0
2615	Mt Airy Manufacturing Co. Baltimore, Md.	Piedmont Pure Raw Bone Meal.	15	33	37	15
2215	L. Moritz, Philadelphia, Pa.	Bone	41	17	25	17
2650	North-Western Fertilizer Co., Chicago, Ill.	Horse Shoe Brand Fine Raw Bone.	22	29	49	0
2452	" " " "	Ralston Bone Meal	17	19	31	33
2455	Nickerson Fertilizer Co., Easton. Md.	Pure Ground Bone	45	36	11	8
2289	R. H. Pollock, Baltimore, Md..	Ground Animal Bone	27	22	38	13
2420	Henry Reckord Manufacturing Co., Bel Air, Md.	Fine Ground Bone	15	25	30	30
2414	" " "	Raw Bone	6	31	38	25
2421	" " "	Raw Bone	13	37	27	23
2636	H. S. Roberts, Westminster, Md	Ground Bone	27	24	37	12

Bulletin No. 37, February, 1896.

Table Showing Mechanical Analysis of Ground Bone, (Continued.)

No.	NAME AND ADDRESS OF MANUFACTURER.	NAME OF FERTILIZER.	Fine, Less than 1-50 inch.	Fine-Medium, 1-25 to 1-50 inch.	Medium, 1-12 to 1-25 inch.	Course, Larger than 1-12 inch.
2446	Scott Fertilizer Co., Elkton, Md.	Pure Ground Bone...........	15	21	46	18
2555	M. L. Shoemaker & Co, Philadelphia, Pa.	Pure Raw Bone Meal.........	31	32	37	0
2556	" " " "	Swift and Sure Bone Meal....	49	42	9	0
2598	J. W. Stonebraker & Son, Hagerstown, Md.	Bone Meal......................	22	39	39	0
2593	Susquehanna Fertilizer Co., Baltimore, Md.	Ground Bone.....	18	30	34	18
2659	" " "	Pure Raw Bone................	12	26	20	42
2610	Swift & Co., Chicago, Ill	Ground Steamed Bone.........	38	31	14	17
2609	" " " "	Raw Bone Meal	15	35	50	0
2258	D. A. Thomas, Hagerstown, Md.	Fine Raw Bone.................	14	39	47	0
2550	Tygert-Allen Co., Philadelphia, Pa.	Star Pure Ground Bone........	31	30	39	0
2425	Wooldridge Fertilizer & Chemical Co., Baltimore, Md.	Chicago Bone Meal.............	57	24	19	0
2468	" " "	Pure Raw Bone..........	45	44	11	0

LIST OF FERTILIZERS LICENSED FOR SALE IN MARYLAND FOR THE YEAR ENDING JANUARY 31, 1896. SUPPLEMENTARY TO LIST DATED JUNE 24, 1895, IN BULLETIN NO. 34.

Alexandria Fertilizer and Chemical Co., Alexandria, Va.
Dissolved S. C. Bone.

Baltimore Guano Co., Baltimore, Md.
Baltimore Special.
Eagle Phosphate.
Farmers' Alkaline Bone.
Farmers' Dissolved Bone.

Baugh & Sons Co., Baltimore, Md.
Fish Mixture.
High Grade Truck Fertilizer.
Soluble Alkaline Superphosphate.
Special Mixture.
Wheat Fertilizer.

Beck & Walker, Chestertown, Md.
Propagator.
Trustworthy.
Try Me.

B. A. Betts, Chewsville, Md.
Jos. Lister's Bone Meal.
Pure Dissolved Bone.

A. D. Birely & Sons, Ladiesburg, Md.
Ammoniated Bone.
Dissolved Bone.

Brumfield & Foster, Colora, Md.
Acid Phosphate and Potash.
Hard Times Ammoniated Phosphate.
High Grade Acid Phosphate.

Chemical Company of Canton, Baltimore, Md
Baker's Standard Guano.
Baker's Dissolved Bone Phosphate.
Gem Phosphate.

R. L. Christie & Co., Baltimore, Md.
Soluble Bone and Potash.
Special Bone and Vegetable.
Special for Corn, Oats, Wheat and Grass.
Sure Crop Ammoniated Phosphate.

E. A. Clendennin & Bro., Colora, Md.

High Grade Acid Phosphate.
F. F. V. Ammoniated Phosphate.
National Standard Ammoniated Phosphate.
Potato and Tobacco Phosphate.
Potato and Truck Compound.
Pure Dissolved Bone.
Pure Ground Bone.
Soluble Bone Phosphate.
Wheat and Grass Special Compound.

E. E. DeLashmutt, Frederick, Md.

Mixture.

Detrick Fertilizer and Chemical Co., Baltimore, Md.

Dissolved S. C. Bone.
Farmer's Friend.
Imperial Compound.
S. W. Barrick's Ammoniated Dissolved Bone.
Jas. M. Smith's Ammoniated Bone Superphosphate.
Jas. M. Smith's Dissolved Bone Phosphate.
Jas. M. Smith's Monogram Ammoniated Bone.

Dr. G. W. Dorsey, Mackall, Md.

Tobacco Bed Fertilizer.
Tobacco Food.

Josh. W. Dorsey, Ellicott City, Md.

Mixture D.

Eureka Fertilizer Co., Perryville, Md.

Grain and Grass Mixture.
Pure Dissolved Bone.
Pure Fine Ground Bone.

T. H. Gill, Avalon, Md.

Standard Corn and Oats Fertilizer.

G. W. Grafflin & Son, Baltimore, Md.

Harford Bone.

Griffith & Boyd, Baltimore, Md.

J. H. Livingston's Champion Fertilizer.

Griffith, Turner & Co., Baltimore, Md.

Soft Ground Bone.
Soluble Bone Phosphate.

E. O. Grimes, Westminster, Md.

Bone Phosphate.

Hubbard & Co., Baltimore, Md.

Smith's Farmer's Friend Phosphate.
Victor.

S. L. Lamberd & Co., Baltimore, Md.

Standard Bone Phosphate.
Wheat and Grass Grower.

Lechleider Bros., Hagerstown, Md.

Eagle Bone Compound.
S. C. Bone.

Wm. McKenny, Centreville, Md.

Compound.
Soluble.

Medford Fertilizer Co., Medford, Md.

No. 1 Bone Phosphate.

Miller Fertilizer Co., Baltimore, Md.

Clinch.
Dissolved Raw Bone.
Special Wheat Grower.

Geo. W. Miller, Baltimore, Md.

Mixture.
Royal Wheat, Corn and Grass Grower.

Mt. Airy Manufacturing Co., Baltimore, Md.

Star Soluble Bone and Potash.

G. Ober & Sons Co., Baltimore, Md.

Ammoniated Wheat and Grass Grower.
Farmers' Mixture.
Gassaway's Ammoniated Dissolved Bone.
Gassaway's Animal Dissolved Bone.
Gassaway's Farmers' Mixture.

Patapsco Guano Co., Baltimore, Md.

Dissolved S. C. Bone.
Harper's Superphosphate.

Phila. & Smyrna Transportation Co., Smyrna, Del.

Soluble Bone and Potash.
Steamer Bone Phosphate.

Raisin Fertilizer Co., Baltimore, Md.

Judge Robert's Special Mixture.

H. S. Roberts & Co., Westminster, Md.

Super.

Scott Fertilizer Co., Elkton, Md.

Tip Top Soluble Bone and Potash.

Sharpless & Carpenter., Philadelphia, Pa.
New Rival Phosphate.
Potato Phosphate.
Pure Dissolved Bone.

J. D. Simmons, Hagerstown, Md.
Honest Fertilizer.

Slingluff & Co., Baltimore, Md.
Half-and-Half.

C. W. Stocksdale, Thurmont, Md.
Ammoniated Animal Bone Phosphate.
Ammoniated Superphosphate.

J. W. Stonebraker & Son, Hagerstown, Md.
Bone Meal.
Dissolved Bone.

Jos. A. Stouffer, New Windsor, Md,
Maynard's No. 1 Animal Bone Phosphate.

Susquehanna Fertilizer Co., Baltimore, Md
C. M. Keedy's Dissolved Animal, Bone.

D. A. Thomas, Hagerstown, Md.
Bone Mixture.
Dissolved Bone.
Farmers' Mixture.
Fine Raw Mixture.
S. C. Bone.

W. B. Tilghman Co., Salisbury, Md.
Bone Tankage.

Turner & Son, Betterton, Md.
"B" Bone Phosphate.

Tygert-Allen Fertilizer Co., Philadelphia, Pa.
Beverly Mixture.
Clogg's Soluble Bone and Potash.
Pure Dissolved Bone.
Pure Ground Bone.

J. Tyson & Son, Frederick, Md.
Dissolved S. C. Bone.

S. L. Webster & Son, Bambridge, Md.
Times Bone Phosphate.

Wheeler & Co., Rutland, Vt.
Electric Dissolved Bone.
Grass and Oats Fertilizer.
Royal Wheat Fertilizer.

Zell Guano Co., Baltimore Md.
Pure Dissolved Animal Bone.

THE VALUATION OF FERTILIZERS.

The last two columns of the table give, side by side, the "comparative value found," or calculated from the analysis made in the College laboratory, and the "comparative value guaranteed," i. e. the value calculated from the guaranteed analysis as stamped on the bags, using the same standards as before. This shows at a glance whether the fertilizer is more or less valuable than guaranteed. It does not show, however, variations due to irregular mixing, when a deficit of one ingredient is balanced by a corresponding excess of another.

The standards of valuation in use for the current year are as follows:

In Mixed Fertilizer:				
For Nitrogen, calculated as Ammonia	15	cts.	per	pound
" Potash (K_2O), in forms free from muriate	6	"	"	"
" Potash (K_2O), as muriate	5	"	"	"
" Available Phosphoric Acid	6	"	"	"
" Insoluble Phosphoric Acid	3	"	"	"
" " " " when from S. C. Rock	2	"	"	"
In Dissolved S. C. Rock:				
Available Phosphoric Acid	5	"	"	"
In Ground Bone:				
For Nitrogen, calculated as Ammonia, in "Fine" Bone	14	"	"	"
" Nitrogen, calculated as Ammonia, in "Fine Medium" Bone	12	"	"	"
" Nitrogen, calculated as Ammonia, in "Medium" Bone	10	"	"	"
" Nitrogen, calculated as Ammonia, in "Coarse" Bone	8	"	"	"
" Phosphoric Acid in "Fine" Bone	5	"	"	"
" " " " "Fine-Medium" Bone	4	"	"	"
" " " " "Medium" "	3	"	"	"
" " " " "Coarse" "	2	"	"	"
In Tankage:				
For Nitrogen, calculated as Ammonia	12	"	"	"
" Phosphoric Acid	3	"	"	"
In Nitrate of Soda:				
For Nitrogen, calculated as Ammonia	12	"	"	"

The "comparative values *found*" by using these figures are not intended to represent the proper selling prices of fertilizers at the place of sale or use. The rates used are the wholesale prices at which a pound of phosphoric acid, potash and ammonia can now be purchased in their various forms for cash, in our large markets, *plus* 25 *to* 50 *per cent.* This, it is thought, is sufficient to cover the cost of mixing and bagging. The freight rate from Baltimore should be added when comparing prices in other parts of the State.

Ground bone is sifted into four successive grades of fineness, using sieves with circular perforations, as follows:

Less than 1-50 inch, "Fine."
Less than 1-25 inch, "Fine-Medium."
Less than 1-12 inch, "Medium."
Over 1-12 inch, "Coarse."

Each grade has its own valuation assigned for both phosphoric acid and ammonia as given above. The results are given in the table marked "mechanical analysis of ground bone."

MARYLAND

Agricultural Experiment Station.

BULLETIN NO. 38.

POTATO EXPERIMENTS.

COLLEGE PARK, MD.

1896.

MARYLAND

Agricultural Experiment Station.

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NOTICE.

The bulletins of the Station will be mailed free to any citizen of Maryland who sends his name and address to the Station for that purpose.

Correspondents will please notify the Director of changes in their post-office address, or any failure to receive the bulletins.

ADDRESS,

MARYLAND AGRICULTURAL EXPERIMENT STATION,

COLLEGE PARK, MARYLAND,

POTATO EXPERIMENTS.

By Robert H. Miller and E. H. Brinkley.

The past season has been an unfavorable one for field experiments with potatoes, as the weather conditions have been far from normal. The early crop had to contend with excessive rain falls, accompanied by unusually cold weather, which followed soon after the potatoes were planted, which caused many of the varieties to rot in the ground; while the late crop, which included all the experiments made except the test of early varieties, was subject to a very severe drouth which commenced shortly after the potatoes were planted, and continued throughout almost the entire growing season. The fertilizer test, owing to this great lack of moisture, was more seriously interfered with than any of the other tests; the results obtained, therefore, cannot be regarded as conclusive.

The following experiments were made with potatoes during the season of 1895:

No. 1. Test of Early Varieties.
No. 2. Fertilizer Experiments.
No. 3. Crimson Clover Plowed down for Potatoes.
No. 4. Early vs. Late Cultivation.
No. 5. Ridge vs. Level Cultivation.
No. 6. Deep vs. Shallow Cultivation.
No. 7. Wide vs. Narrow Rows.
No. 8. Spraying with Bordeaux Mixture to Prevent Blight.

TEST OF EARLY VARIETIES.

The land used for this test is a clay soil with a small admixture of loam and gravel, and was in wheat in 1893, and was seeded to grass. A heavy crop of hay was cut the season of 1894, leaving a fine sod, which was turned under for potatoes the 20th of March, 1895. On April 5th the land was put in thorough order with the spring tooth harrow and rubber, and potatoes were planted April 6th. The rows were run out with a single shovel plow with an extra wide shovel attached, the rows being 2 feet 4 inches apart, two rows of each variety were planted. A space of 3½ feet was left between varieties. Every fifth plot was planted in Early Rose as a check plot to detect any unevenness of the soil. Potatoes were dropped 16 inches apart in the row, the same number of pieces being planted in each plot. Seven hundred pounds of fertilizer was used per acre, and was applied in the drill before potatoes were dropped.

The Fertilizer was composed as follows:

2 parts of Dissolved S. C. rock,
1 part of dried ground fish,
1 part of Muriate of Potash.

36 varieties were planted, but owing to the ill effects of the continued wet, cold weather, previously mentioned, we can only report on 11 of the varieties, which being on rather higher land, were not so much affected by the unfavorable conditions. The land was left in ridges two weeks after planting or until April 20th, when it was rubbed down flat, and afterwards harrowed with smoothing harrow just as potatoes were coming up. This system which was followed in all of the tests made, has the great advantage of checking the growth of all weeds a short time before cultivation commences, thus saving much of the work of hand hoeing. The after cultivation consisted of going over them with the hoe on May 22nd and three subsequent workings with cultivator with narrow plates attached.

The following table gives the yield in bushels and pounds of merchantable and unmerchantable potatoes per acre, the source from which seed was obtained, also the dates when the first five varieties were ready to market. The remaining six varieties follow in succession in the order of their time of ripening.

TABLE I.

YIELD PER ACRE IN BUSHELS AND POUNDS, ETC.

Plot No.	Name of Variety.	Merchantable		Unmerchantable		Total Yield		When ready for market	Seed Purchased from
		bus.	lbs	bus.	lbs	bus.	lbs		
1	Acme Seedling	202	05	20	47	222	52	June 29	Vaughn
2	Early Harvest	238	06	32	42	270	48	July 7	Jerrard
3	New Queen	258	41	18	54	277	39	July 12	Jerrard
4	**Early Rose**	**202**	**40**	**29**	**41**	**231**	**41**	"	**Md. Grange Agency**
5	Early Norther	267	02	26	03	293	05	"	Jerrard
6	Summit	144	27	20	29	164	55	"	Jerrard
7	Garfield	232	03	22	29	254	32	"	Landreth
8	Dreers Standard	206	47	24	31	231	22	"	Dreer
9	**Early Rose**	**199**	**33**	**26**	**13**	**225**	**46**		**Md. Grange Agency**
10	Chas. Downing	230	45	24	44	255	33	"	Maule
11	Crown Jewell	269	33	40	35	310	12	"	Dreer
12	Pearl of Savoy	243	04	29	49	272	53	"	Jerrard

As will be seen from Table I, the Acme Seedling was more than a week earlier than any other variety, but the yield was much lighter than some of those ripening later.

The Pearl of Savoy, Early Norther and Crown Jewell gave the heaviest yields of later varieties ripening.

FERTILIZER TESTS.

The land used for these experiments from plot one to ten inclusive, had been in oats in 1894, and is a gravelly clay.

It was plowed June 12th, and after being thoroughly prepared, the rows were run out as described in variety tests. In this case the rows were 2½ feet apart, and potatoes dropped fourteen inches apart in the row. The potatoes were planted June 25th and 26th, and all fertilizers were applied in drill before potatoes were dropped. Each plot contained two rows and between each of these plots, one row was planted without having any fertilizer applied, so that there might not be any chance of potatoes on the different plots receiving any benefit from the fertilizers from adjoining plots.

In making up the schedule for these tests, we have used dissolved South Carolina rock (phosphoric acid) as the basis, from the fact that all the soils of this farm, and most of the soils of the State, are deficient in available phosphoric acid. In some cases phosphoric acid and potash are combined, in others, phosphoric acid and nitrogen.

There is also a comparison of the principal sources of potash, viz: Kainit, Muriate and Sulphate.

The kinds and amounts of the various ingredients, applied together with the yields, are given in the following table II:

TABLE II.

YIELD OF POTATOES ON FERTILIZER PLOTS.

In bushels per acre.

Plot No.	Kind of Fertilizer.	Pounds of Fertilizer per Acre.	Merchantable Potatoes per Acre.	Unmerchantable Potatoes per Acre.	Total Yield.
		Lbs.	Bush.	Bush.	Bush.
1.	Dissolved S. C. rock.......	400	50.5	23.8	74.3
2.	Dissolved S. C. rock.......	600	70.4	22.8	93.2
3.	Dissolved S. C. rock....... Muriate of Potash..........	400 150 } 550	70.4	10.9	81.3
4.	Dissolved S. C. rock. ..... Sulphate of Potash........	400 150 } 550	61.4	15.9	77.3
5.	Nothing	....	62.7	14.6	77.3
6.	Dissolved S. C. rock....... Kainit....................	400 300 } 700	71.3	8.4	79.7
7.	Dissolved S. C. rock....... Dried blood....	400 150 } 550	68.4	13.9	82.3
8.	Dissolved S. C. rock....... Dried blood........... ... Nitrate of Soda............	400 75 75 } 550	58.5	7.9	66.4
9.	Dissolved S. C. rock....... Dried blood............... Nitrate of Soda............ Muriate of Potash.	400 75 75 150 } 700	77.3	9.9	87.2
10.	Dissolved S. C rock....... Dried blood................ Nitrate of Soda........... Sulphate of Potash........	400 75 75 150 } 700	69.3	12.4	81.7

The weather conditions which prevailed during this experiment were very unfavorable for the growth of anything, and especially so for the action of a fertilizer or the comparison of different fertilizers. As will be seen, it is evident that most of the applications, considering the price of potatoes, were made at a financial loss; yet in most cases the fertilizers produced some increase in growth. In two cases there was a smaller yield with fertilizers than without; this can without doubt be attributed to the season. It is now a well recognized fact that on some soils concentrated fertilizers have a harmful effect in very dry, hot weather, especially the more soluble and nitrogenous fertilizers. This seems to be borne out in the case of Plot No. 8. These results seem to indicate that muriate of potash is the best form in which to apply potash to this soil for potatoes, yet the results are not such as to be conclusive.

CRIMSON CLOVER PLOWED DOWN FOR POTATOES.

The land used for this test is a clay loam and was in wheat in 1893 and was seeded to grass, but the grass failing to set, the land was planted to corn in 1894. This piece of corn was divided into 4 sections. Sections one and three were seeded to crimson clover at the last working of the corn; while sections two and four were not seeded. On May 31, 1895, when the clover had attained its full growth, it was turned under, using plow with chain attached to more thoroughly bury the clover. The adjoining plots on which no clover had been seeded were also plowed at the same time, and the land was left in this condition until July 1st, when it was found that the clover had mostly rotted. Both the crimson clover plots and the others were then thoroughly prepared with spring tooth harrow and the potatoes were planted on July 3rd, 600 pounds of fertilizer per acre being applied to all plots. The rows were 2½ feet apart and potatoes dropped 14 inches in the row. They were cultivated three times: July 7, August 12 and August 22, and were dug October 10th.

The following Table III gives the yield per acre for the respective plots for the two years which the test has been made.

TABLE III.

YIELD OF POTATOES FROM CRIMSON CLOVER AND NO CLOVER.

In bushels per acre.

	CRIMSON CLOVER.			NO CLOVER.		
Years Tested	Merchantable.	Unmerchantable.	Total.	Merchantable.	Unmerchantable.	Total.
	bus.	bus.	bus.	bus.	bus.	bus.
1894	56.3	16.0	72.3	48.6	4.2	52.8
1895	94.3	7.9	102.2	57.5	10.3	67.8
Average	75.3	12.0	87.3	53.1	7.2	60.3

As will be seen from table III, in 1895 crimson clover plowed down gave an increased yield of 34.4 bushels per acre, a gain of 50 per cent.:

while for the average of the two years which the test has been made, the increase has amounted to 27 bushels to the acre, or a gain of 45 per cent.

TESTING DIFFERENT MODES OF CULTIVATION.

The land used in the following experiments, which had for their object the testing of different modes of cultivation, was similar to and part of that described as being used in fertilizer tests. The variety of potatoes was the Burbank, and they were planted June 29th.

Fertilizer at the rate of 600 lbs. to the acre was applied in the drill composed as follows:

1200 lbs. Dissolved S. C. rock.
500 lbs. Tankage.
300 lbs. Sulphate of Potash.

2000 lbs.

In each of the tests the rows were run 2½ feet apart, except in the test of wide and narrow rows, and the potatoes in each of the experiments but this one were dropped 14 inches apart in the row. The potatoes were all cultivated four times on the following dates: July 22, August 2, August 12 and August 21. In each of the experiments there were four sections used, which were separated in each case by a row of potatoes which was cut out of the experiment. This general description, which is common to all four of the following tests, is given that it may not be necessary to repeat it in each case.

EARLY vs. LATE CULTIVATION OF POTATOES.

The object of this test is to ascertain how late it pays to work potatoes. The potatoes on all of the four plots received four workings, July 22, August 2, August 12 and August 21, and those on plots two and four received an additional cultivation on August 31, ten days after the last working of those on plots one and three.

In the following table IV will be found the respective yields for the two years in which the test has been made.

TABLE IV.

YIELD OF POTATOES FROM EARLY AND LATE CULTIVATION.

In bushels per acre.

	EARLY CULTIVATION.			LATE CULTIVATION.		
Years Tested.	Merchantable.	Unmerchantable.	Total.	Merchantable.	Unmerchantable.	Total.
	bus.	bus.	bus.	bus.	bus.	bus.
1894.	96.6	18.0	114.6	96.5	20.0	116.5
1895.	78.1	13.1	91.2	68.4	13.6	82.0
Average.	87.4	15.5	102.9	82.5	16.8	99.3

As will be seen in table IV, the late cultivation gave a slightly better yield than the early in 1894, but this difference might be accounted for by unevenness of soil; but the past season there was a difference of 9.2 bushels in favor of the early cultivation. Taking an average of the two years there has been a slight gain in favor of the early cultivation.

RIDGE vs. LEVEL CULTIVATION.

The cultivation in this test was similar to that described in the previous one, except that at the last working the rows of section one and three were ridged by running a single shovel plow, with broad shovel attached, down the middle of the row.

In the following table V will be found the respective yields for the three years in which the test has been made.

TABLE V.

YIELD OF POTATOES FROM RIDGE AND LEVEL CULTIVATION.

In bushels per acre.

	RIDGE CULTURE.			LEVEL CULTURE.		
Years Tested.	Merchantable.	Unmerchantable.	Total.	Merchantable.	Unmerchantable.	Total.
	bus	bus.	bus.	bus.	bus.	bus.
1893.	71.7	24.1	95.8	72.8	21.3	94.1
1894.	77.8	17 9	95.7	69.6	21.7	91.3
1895.	64 7	14.6	79.3	73.1	8 7	81.8
Average.	71.4	18 9	90 3	71 9	17.2	89 1

As will be seen from Table V the average yield for the three years which the experiment has been made of Ridge and Level Cultivation has been practically the same. The greatest difference in any one year being 4.4 bushels in 1894.

DEEP vs. SHALLOW CULTIVATION.

In this test sections 2 and 4 were cultivated to a depth not to exceed two inches: while sections 1 and 3 were worked to a depth of from 5 to 6 inches.

Table VI gives the results of the experiments for the two years which the test has been made.

TABLE VI.

YIELD OF POTATOES FROM DEEP AND SHALLOW CULTIVATION.

In bushels per acre.

	DEEP CULTIVATION.			SHALLOW CULTIVATION.		
Years Tested.	Merchantable.	Unmerchantable.	Total.	Merchantable.	Unmerchantable.	Total.
	bus.	bus.	bus.	bus.	bus.	bus.
1894	72.0	18.1	90.1	67.7	20 9	88 6
1895	85.2	15.9	101.1	87.0	15.1	102.1
Average.	78.6	17.0	95.6	77.4	18.0	95.4

From Table VI it will be seen that deep and shallow cultivation for potatoes has given nearly identical results, not only in the average of the two years which the tests have been made but each year individually.

WIDE vs. NARROW ROWS.

In sections 2 and 4 in this experiment the rows were 2½ feet wide, and the potatoes were dropped 14 inches apart in the row; in sections 1 and 3, the rows were 3 feet wide, and the cuttings were dropped every 12 inches. Practically the same number of cuttings being planted to the acre in each case.

Table VII, gives the results of the experiments for the two years in which the test has been made.

TABLE VII.

YIELD OF POTATOES FROM WIDE AND NARROW ROWS.

In bushels per acre.

	WIDE ROWS.			NARROW ROWS.		
Years Tested.	Merchantable.	Unmerchantable.	Total.	Merchantable.	Unmerchantable.	Total.
	bus.	bus.	bus,	bus.	bus.	bus.
1894.	67.1	17.9	85.0	86.0	21.0	107.0
1895.	67.5	8.9	76.4	79.5	12.8	92.3
Average ..	67.3	13.4	80.7	82.8	16.9	99.8

It will be seen from Table VII, that where the rows were run 2½ feet apart and the cuttings dropped 14 inches apart in the row, the total yield was decidedly better for each year, and there was a gain of 19 bushels to the acre in the average of the two years, over those planted in rows 3 feet apart with cuttings 12 inches apart in the row.

The more thorough shading of the ground by the vines with the narrow rows is probably the largest factor in causing the difference in yield.

SPRAYING WITH BORDEAUX MIXTURE TO PREVENT THE BLIGHT.

The land used for this experiment was in turnips the season of 1894 and is a sandy clay loam.

The potatoes were planted on June 29th, in the manner described in tests of modes of culture and received the same cultivation, and the same kind and amount of fertilizer was used. There were 4 sections of 2 rows each in the test, the treatment of which was similar in every respect except that sections 1 and 3 were sprayed 5 times on the following dates with Bordeaux Mixture: August 2, August 13, August 22, September 2 and September 7, while sections 2 and 4 were not sprayed at all.

The Bordeaux solution used in this test was made after the following formula: 5 lbs. of sulphate of copper, 5 lbs. of quick lime and 50 gallons of water.

This is prepared as follows: The copper sulphate is dissolved in two gallons of hot water in a wooden pail; this is then poured into a barrel about one-half full of water. The lime is slacked and made into the consistency of ordinary white-wash; then strained through a coarse gunny sack, so as to take out any lumps or matter which would be likely to clog the nozzle of the spraying apparatus. This lime is then poured into a barrel containing the copper sulphate solution, and water added sufficient to make 50 gallons of the entire mixture. The solution should be thoroughly stirred so that the precipitate which has been formed, will be uniformly suspended throughout the whole solution.

TABLE VIII.

YIELD OF POTATOES FROM SPRAYED AND UNSPRAYED.

In bushels per acre.

	SPRAYED.			UNSPRAYED.		
Years Tested.	Merchantable.	Unmerchantable.	Total.	Merchantable.	Unmerchantable.	Total.
	bus.	bus.	bus.	bus.	bus.	bus.
1893.	....	....	81.1	....	....	61.9
1894.	85.9	14.7	100.6	61.9	14.5	76.4
1895.	68.8	15.4	84.2	31.7	13.5	45.2
Average ..	77.4	15.1	90.3	46.8	14.0	61.2

It will be seen from Table VIII that the gain from spraying with the Bordeaux mixture for the past three years has ranged from 24 to 39 bushels to the acre, while the gain in per cent. has ranged from 31.7% to 86.7%. The average gain for the three years has been 29.1 bushels less to the acre or an increase if 47.7%.

AGRICULTURAL DEPARTMENT.

EXPERIMENTS WITH POTATOES, SEASON OF 1895.

By Robert H. Miller and E. H. Brinkley.

SUMMARY OF RESULTS.

1.—Of the early varieties tested the Acme Seedling ripened nine days ahead of any other variety, and gave a yield of 222 bushels. The Early Harvest was second, yielding 270 bushels to the acre. The New Queen, Early Rose and Early Norther were next to ripen in the order named, and yielded respectively 258, 202 and 267 bushels.

2.—Results from fertilizer tests, owing to weather conditions, are not conclusive.

3.—Crimson Clover turned under for potatoes increased the yield in 1894, 36 per cent.; 1895, 50 per cent., or an average of 43 per cent.

4.—Early cultivation, taking the average yield for 1894 and 1895, gave slightly better returns than late cultivation.

5.—Ridge and level cultivation have given practically the same yields for the three years which the test has been made.

6.—Deep and shallow cultivation have given nearly identical yields, taking an average of the two years which the test has been made.

7.—Narrow rows have given larger yields than wide rows in 1894 and 1895, and increased the crop nineteen bushels to the acre, or 23 per cent., taking the average of the two years.

8.—Spraying with the Bordeaux Mixture increased the crop 40 per cent. in 1893, 31 per cent. in 1894 and 86 per cent. in 1895, or an average of 52 per cent. for the three years.

SPRAY CALENDAR.

MARYLAND AGRICULTURAL EXPERIMENT STATION.

BULLETIN No. 39. APRIL, 1896.

ROBERT H. MILLER, *Director.*

Reprint of Bulletin No. 114, of Cornell Agricultural Experiment Station by Consent of L. H. Bailey.

E. G. LODEMAN, Author.

In the preparation of this calendar the most important points regarding sprays have been selected and arranged in such a manner that the grower can see at a glance what to apply and when to make the applications. The more important insect and fungous enemies are also mentioned, so that a fairly clear understanding of the work can be obtained by examining the table below. When making the applications advised, other enemies than those mentioned are also kept under control, for only the most serious ones could be named in so brief an outline. The directions have been carefully compiled from the latest results obtained by leading horticulturists and entomologists, and they may be followed with safety.

NOTICE.—In this calendar it will be seen that some applications are in parentheses and these are the ones which are *least important.* The number of applications given in each case has particular reference to localities in which fungous and insect enemies are most abundant. If the crops are not troubled when some applications are advised, it is unnecessary to make them. [illegible] the exercise of proper judgment in making applications. Know the enemy to be destroyed, know the remedies that are most effective, and finally, apply them at the proper season. [illegible] *prompt, thorough,* and *persistent.* Knowledge and good judgment are more necessary to success than any definite rules.

Apple.	*Scab.* (1. Copper sulphate solution before buds break). 2. Bordeaux mixture when leaf buds are open, but before flower buds expand, 3. repeat 2 as soon as blossoms have fallen, 4. Bordeaux mixture 10 to 14 days after the third; (5, 6, repeat 4 at intervals of about two weeks).—*Canker-worm.* 1. When first caterpillars appear apply Paris green very thoroughly; 2. repeat 1 after 8 to 10 days; (3, 4, repeat every 10 days if necessary).—*Bud moth.* 1. As soon as leaf tips appear in buds Paris green, 2. repeat 1 before the blossom buds open, (3. repeat 2 when blossoms have fallen). —*Codlin-moth.* 1. Paris green immediately after blossoms have fallen, 2. repeat 1, 7 to 10 days later, (3, 4, Paris green at intervals of 1 to 3 weeks after 2, especially if later broods are troublesome). Paris green may be added to the Bordeaux mixture and the two applied together with excellent effect.—*Case-bearer.* As for *bud moth.*
Bean.	*Anthracnose, Pod-rust.* 1. Bordeaux mixture, when first true leaf has expanded, 2, 3, etc., the same, at short intervals to keep the foliage covered by the mixture.
Beet.	*Leaf spot.* When 4 or 5 leaves have expanded, Bordeaux mixture, 2, 3, etc., the same every 10 to 14 days.
Cabbage and Cauliflower.	*Aphis.* Kerosene emulsion. *Cabbage worm.* 1. If plants are not heading, kerosene emulsion or arsenites, 2. repeat 1 at intervals of 7 to 10 days; 3. If plants are heading, hellebore, or water at 130° to 135°F.; 4, 5, etc., repeat 3 when necessary.—*Plusia.* 1. Make very thorough applications as recommended under *cabbage worm.*
Carnation.	*Anthracnose, Rust, Spot.* 1. At first appearance of disease, Bordeaux mixture thoroughly applied in *fine* spray, 2, 3, etc., if plants are not blooming, Bordeaux mixture, ammoniacal copper carbonate to avoid staining the flowers. Keep foliages covered with a fungicide. *Red spider.* Syringe freely with clear water, kerosene emulsion.
Celery.	*Leaf-blight. Rust.* 1. Ammoniacal copper carbonate at first appearance of disease; repeat 1 to keep foliages protected.
Cherry.	*Black knot.* See PLUM.—*Rot.* 1. When buds break, Bordeaux mixture, 2. when fruit has set, repeat 1, 3, when fruit is grown, ammoniacal copper carbonate. *Aphis.* 1. Kerosene emulsion when insects appear, 2, 3, repeat at intervals of 3 to 4 days if necessary.—*Slug.* 1. When insects appear, arsenites, hellebore or air-slaked lime; 2, 3, repeat 1 in 10 to 14 days if necessary.
Chrysanthemum.	*Leaf-spot.* 1. Bordeaux mixture, or ammoniacal copper carbonate at intervals of 10 to 14 days, to keep foliage protected.
Cranberry.	*Fire-worm, Fruit-worm.* 1. When larvæ first appear, arsenites, kerosene emulsion, or tobacco water, 2, after 10 to 14 days repeat 1; 3, repeat if necessary.
Currant.	*Leaf-blights.* 1. When injury first appears, before the fruit is harvested, ammoniacal copper carbonate, to avoid staining the fruit, 2. After fruit is harvested, Bordeaux mixture freely applied, 3, repeat 2 when necessary.—*Worm.* 1. When first leaves are nearly expanded, arsenites; 2. After 10 to 14 days, hellebore, 3, repeat 2 if necessary.
Eggplant.	*Leaf-spot.* 1. As soon as plants are established in the field, Bordeaux mixture; 2, 3, repeat 1 at intervals of 2 to 3 weeks till first fruits are ½ grown; 4. ammoniacal copper carbonate, repeat when necessary.
Gooseberry.	*Mildew.* 1. Before buds break, Bordeaux mixture, 2. when first leaves have expanded, Bordeaux mixture or potassium sulphide, 3, 4, etc., repeat 2 at intervals of 7 to 10 days, if necessary throughout the summer. Avoid staining the fruit.—*Currant worm,* see under CURRANT.
Grape.	*Anthracnose.* 1. Before buds break in spring, sulphate of iron and sulphuric acid solution, 2. Repeat 1 after 3 or 4 days to cover untreated portions. *Black-rot.* (1, as soon as first leaves are fully expanded, Bordeaux mixture) 2. after fruit has set, Bordeaux mixture, 3 repeat 2 at intervals of 2 to 3 weeks until fruit is ½ grown, 4. ammoniacal copper carbonate when fruit is nearly grown. 5, 6, etc., repeat 4 at intervals of 7 to 14 days as required.—*Downy mildew, Powdery mildew,* the first application recommended under *Black rot* are of especial importance. *Ripe rot,* apply very thoroughly the later applications recommended under *Black-rot.*—*Steely-bug.* 1. As buds are swelling, arsenites; 2, after 10 to 14 days, repeat 1.
Hollyhock.	*Rust.* 1. In spring, when foliage expands, Bordeaux mixture, 2, 3, etc, apply a good fungicide at short intervals to keep new growths covered.
Nursery Stock	*Fungous diseases.* 1. When first leaves appear, Bordeaux mixture; 2, 3, etc., repeat 1 at intervals of 10 to 14 days to keep foliage well covered.
Peach, Nectarine, Apricot.	*Brown-rot.* 1. Before buds swell, copper sulphate solution; (2 before flowers open, Bordeaux mixture), 3, when fruit has set, repeat 1, 4, repeat after 10 to 14 days, 5, when fruit is nearly grown, ammoniacal copper carbonate, 6, 7, etc., repeat 5 at intervals of 5 to 7 days if necessary.
Pear.	*Leaf blight or Fruit-spot.* (1. As buds are swelling copper sulphate solution); 2 just before blossoms open, Bordeaux mixture, 3 after fruit has set, repeat 2, 4, 5, etc., repeat 2 at intervals of 2 to 3 weeks as appears necessary. *Leaf-blister.* 1. Before buds swell in spring, kerosene emulsion, diluted 5 to 7 times—*Psylla.* 1. When first leaves have unfolded in spring, kerosene emulsion diluted 15 times; 2, 3, etc., at intervals of 2 to 6 days repeat 1 until the insects are destroyed.—*Slug.* See under CHERRY.
Plum.	*Brown-rot.* See under PEACH.—*Leaf blight.* (1. When first leaves have unfolded, Bordeaux mixture); 2. When fruit has set, Bordeaux mixture, 3, 4, etc. repeat 2 at intervals of 2 to 3 weeks, use a clear fungicide after fruit is ½ grown.—*Black-knot.* 1. During first warm days of early spring, Bordeaux mixture; 2 repeat 1 when buds are swelling; 3. during latter part of May repeat 1, 4. repeat 1 during middle of June 15, repeat 1 in July. —*Curculio,* spraying is not always satisfactory; jar the trees after fruit has set, at intervals of 1 to 3 days during 2 to 5 weeks.—*Plum Scale.* 1. In autumn when leaves have fallen, kerosene emulsion, diluted 4 times, 2 and 3 in spring, before buds open, repeat 1.—*San José Scale.* Thorough application of kerosene emulsion as recommended under Plum Scale may prove effective if followed later in the season by others, diluting the emulsion to avoid injuring foliage. (Note:—Recent tests in Maryland indicate that spraying with hot whale oil soap solution (2 lbs to 1 gal. water) while buds are dormant is more effective.
Potato.	*Early blight.* 1. When vines are ⅔ grown, Bordeaux mixture; 2 and 3, repeat 1 at intervals of 2 to 3 weeks (only partially successful).—*Rot.* 1. During middle of July, Bordeaux mixture, 2 and 3 at intervals of 1 to 3 weeks, repeat 1.—*Scab.* Soak uncut seed potatoes 1½ hours in solution of 1 ounce corrosive sublimate in 8 gallons water.—*Potato beetle.* 1. When beetles first appear, arsenites. 2 and 3, repeat 1 when necessary.
Quince.	*Leaf blight,* or *Fruit-spot.* (1 When blossom buds appear, Bordeaux mixture), 2. when fruit has set, repeat 1; 3, 4, etc. repeat 2 at intervals of 2 weeks, until fruit is ⅔ grown if later treatments are necessary, ammoniacal copper carbonate.
Raspberry, Blackberry, Dewberry.	*Anthracnose.* 1. Before buds break copper sulphate solution, also cut out badly infested canes; 2. when growth has commenced, Bordeaux mixture, 3, 4, etc. repeat 2 at intervals of 2 to 3 weeks, avoid staining fruit by use of clear fungicide. (Partially successful.)—*Orange-rust.* Remove and destroy affected plant as soon as discovered. —*Saw-fly.* 1. When first leaves have expanded, arsenites, 2. after 2 to 3 weeks repeat 1, or apply kerosene emulsion (unsatisfactory).
Rose.	*Black-spot.* Spray plants once a week with ammoniacal copper carbonate.—*Mildew.* Keep heating pipes painted with equal part lime and sulphur mixed with water to form a thin paste. Spray with copper fungicides.—*Aphis. Leaf hopper.* Kerosene emulsion or tobacco water applied to the insects' bodies at short intervals, is effective. *Red spider.* Spray as for APHIS, or with forcible streams of clear water.
Strawberry.	*Leaf-blight.* 1. When growth begins in spring, Bordeaux mixture; 2. when first fruits are setting, repeat 1, 3. during fruiting season, ammoniacal copper carbonate; 4. after fruiting, or on non-bearing plants, Bordeaux mixture at intervals of 1 to 3 weeks.—*Saw-fly.* Spray plants when not in bearing with arsenites, repeating application if necessary.
Tomato.	*Leaf-blight.* 1. As soon as disease is discovered, Bordeaux mixture or a clear fungicide. 2, 3, etc. repeat 1 at intervals of 7 to 10 days.—*Rot.* Spray as directed under *leaf-blight* (unsatisfactory in many cases).
Violet.	*Blight; Spot.* 1. When disease is first seen in summer or fall, Bordeaux mixture; 2, 3, etc. repeat one at intervals of 1 to 2 weeks, using ammoniacal copper carbonate to avoid staining blossoms. (Not always satisfactory as good culture must also be given.) Remove affected leaves.

FORMULAS.

Paris Green.

Paris green..—1 pound
Water...150-300 gallons

If this mixture is to be used upon fruit trees, 1 pound of quicklime should be added, and repeated applications will injure most foliage, unless the lime is used. *Paris green and Bordeaux mixture can be applied together with perfect safety.* Use at the rate of 4 ounces of the arsenites to 50 gallons of the mixture. The action of neither is weakened, and the Paris green loses all caustic properties. For insects which chew.

London Purple.

This is used in the same proportion as Paris green, but as it is more caustic it should be applied with two or three times its weight of lime, or with the Bordeaux mixture. The composition of London purple is variable, and unless good reasons exist for supposing that it contains as much arsenic as Paris green, use the latter poison. Do not use London Purple on peach or plum trees unless considerable lime is added. For insects which chew.

Normal or 1.6 Per Cent. Bordeaux Mixture.

Copper Sulphate.....................................6 pounds
Quicklime...4 "
Water...40-50 gallons

Dissolve the copper sulphate by putting it in a bag of coarse cloth and hanging this in a vessel holding at least 4 gallons, so that it is just covered by the water. Use an earthen or *wooden vessel.* Slake the lime in an equal amount of water. Then mix the two and add enough water to make 40 gallons. It is then ready for immediate use. If the mixture is to be used on peach foliage it is advisable to add two pounds of lime in the above formula. When applied to such plants as carnations or cabbages it will adhere better if about a pound of hard soap be dissolved in hot water and added to the mixture. For rots, moulds, mildews, and all fungous diseases.

Iron Sulphate and Sulphuric Acid Solution.

Water (hot)..100 parts
Iron sulphate, as much as the water will dissolve.
Sulphuric acid (commercial)..........................1 part

The solution should be prepared just before using. Add the acid to the crystals, and then pour on the water. Valuable for grape anthracnose, the dormant vines being treated by means of sponges or brushes.

Potassium Sulphide Solution.

Potassium sulphide.................................½-1 oz.
Water..1 gallon

This preparation loses its strength upon standing, so should be made immediately before using. Particularly valuable for surface mildews.

Ammoniacal Copper Carbonate. (clear fungicide.)

Copper carbonate...................................1 oz.
Ammonia, enough to dissolve the copper.
Water..9 gallons.

Before making the solution, the ammonia should be prepared as follows: Use 26° ammonia, and dilute with 7 to 8 volumes of water. Then gradually add the necessary amount to the copper carbonate until all is dissolved. It is best treated in large bottles, and in them it will keep indefinitely. Dilute as required. For same purposes as the Bordeaux mixture.

Copper Sulphate Solution.

Copper sulphate....................................1 pound
Water..15 gallons.

Dissolve the copper sulphate in the water, when it is ready for use. *This should never be applied to foliage, but must be used before the buds break.* For peaches and nectarines use 25 gallons of water. For fungous diseases.

Hellebore.

Fresh white hellebore..............................1 ounce.
Water..3 gallons.

Apply when thoroughly mixed. This poison is not so energetic as the arsenites, and may be used a short time before the sprayed portions mature. For insects which chew.

Kerosene Emulsion.

Hard soap..½ pound
Boiling water......................................1 gallon.
Kerosene...2 gallons.

Dissolve the soap in the water, add the kerosene, and churn with a pump for 5-10 minutes. Dilute 4 to 25 times before applying. Use strong emulsion for all scale insects. For such insects as plant lice, mealy bugs, red spider, thrips, weaker preparations will prove effective. Cabbage worms, currant worms and all insects which have soft bodies, can also be successfully treated. It is advisable to make the emulsion shortly before it is used.

Tobacco Water.

This solution may be prepared by placing tobacco stems in a water-tight vessel and then covering them with hot water. Allow to stand several hours, dilute the liquor from 3 to 5 times and apply. For soft bodied insects.

Approximate Cost of Materials per Pound.

(Prices subject to change from time to time.)

Copper Sulphate (granular) 450 lbs. @ 4½c. 100 lbs @ 5c. 25 lbs @ 6c.
Copper Carbonate, 25 lbs @ 30c. 10 lbs @ 35c. 5 lbs @ 40c.
Corrosive Sublimate, 5 lbs @ $1 00. 1 lb @ $1 10.
Ammonia, 26°, 200 lbs @ 8c. 8 lbs @ 10c.
Whale Oil Soap, 400 lbs @ 4½c. 50 lbs. @ 6c. 25 lbs @ 8c.
Paris Green, 20 cts per pound.
London Purple, 20 cts per pound.
White Hellebore, 15 cts. per pound.

These materials can be gotten of Powell Fertilizer and Chemical Company, of Baltimore, Md.

MARYLAND

Agricultural Experiment Station.

BULLETIN NO. 40.

SPECIAL ISSUE.

COMPOSITION OF
COMMERCIAL FERTILIZERS
SOLD IN THIS STATE.

COLLEGE PARK, MD.

AUGUST, 1896.

MARYLAND

Agricultural Experiment Station.

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Located on the B. & O. R. R., 8 miles N. of Washington, D. C.

NOTE: Under the laws of Maryland, the Inspection, sampling and analysis of commercial fertilizers is to be done under the auspices of the Maryland Agricultural College by the Professor of Chemistry of the College, who is ex-officio State Chemist. The results of these examinations, being agricultural information of value and general interest, will be published, from time to time, as Special Bulletins, from the Maryland Agricultural Experiment Station.

These Bulletins will be mailed, free, to any farmer who asks for them.

ADDRESS,

MARYLAND AGRICULTURAL EXPERIMENT STATION,

COLLEGE PARK, MARYLAND.

INSPECTION AND ANALYSIS OF

COMMERCIAL FERTILIZERS SOLD IN MARYLAND.

BY THE CHEMICAL DEPARTMENT OF THE

MARYLAND AGRICULTURAL COLLEGE.

Dr. H. B. McDonnell, *State Chemist.*
*H. C. Sherman, M. S., *Assistant Chemist.*
F. P. Veitch, B. S., *Assistant Chemist.*
F. B. Bomberger, B. S., *Assistant Chemist.*
W. W. Skinner, B. S., *Assistant Chemist.*
†C. C. McDonnell, B. S., *Assistant Chemist.*
‡J. R. Langlin, B. S., *Assistant Chemist.*

The following table gives, side by side, the analysis of the various fertilizers as made in the laboratory and the guaranteed analysis as stamped on the bags. The figures indicate per cent. or parts in a hundred, except the columns headed "No.," which contains the respective numbers by which the samples are known in the laboratory, and the last two columns, which contain respectively the "camparative value found" by analysis and the "comparative value guaranteed," the former is calculated from the "analysis found," the latter is calculated from the "analysis guaranteed" as stamped on the bags; in each case using the following schedule of values for the various ingredients:

In Mixed Fertilizer:	
For Nitrogen, calculated as Ammonia	15 cts. per pound.
" Potash (K_2O), in forms free from muriate	6 " " "
" Potash (K_2O), as muriate	5 " " "
" Available Phosphoric Acid	6 " " "
" Insoluble Phosphoric Acid	3 " " "
" " " " when from S. C. Rock	2 " " "
In Dissolved S. C. Rock:	
Available Phosphoric Acid	5 " " "
In Ground Bone:	
For Nitrogen, calculated as Ammonia, in "Fine" Bone	14 " " "
" Nitrogen, calculated as Ammonia, in "Fine Medium" Bone	12 " " "
" Nitrogen, calculated as Ammonia, in "Medium" Bone	10 " " "
" Nitrogen, calculated as Ammonia, in "Coarse" Bone	8 " " "
" Phosphoric Acid in "Fine" Bone	5 " " "
" " " " "Fine-Medium" Bone	4 " " "
" " " " "Medium" "	3 " " "
" " " " "Coarse" "	2 " " "
In Tankage:	
For Nitrogen, calculated as Ammonia	12 " " "
" Phosphoric Acid	3 " " "
In Nitrate of Soda:	
For Nitrogen, calculated as Ammonia	12 " " "

The Mechanical Analysis of ground bone is made by using a sieve with circular holes as follows:

Less than 1-50 inch, "Fine."
Less than 1-25 inch, "Fine-Medium."
Less than 1-12 inch, "Medium."
Over 1-12 inch, "Coarse."

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*Leave of absence for one year from July 1, 1896. †Resigned July 1st. ‡After July 1st.

Table of Analysis and Valuations of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2870	Alexander Fert. & Chem. Co., Alexandria Va.	Dissolved S. C. Bone	Williamsport
2818	A. Anderson & Co., Mt. Airy, Md.	Harvest Queen Guano	Mt. Airy
2764	Baltimore Guano Co., Baltimore, Md.	B. G. Ammoniated Bone Phosphate.	Baltimore
2709	“ “ “ “	B. G. Potato Fertilizer	Baltimore
2694	“ “ “ “	Eagle Phosphate	Baltimore
2690	“ “ “ “	Farmers’ Alkaline Bone	Baltimore
2904	“ “ “ “	Farmers’ Dissolved Bone	Hampstead
2692	“ “ “ “	Salvador Guano	Baltimore
2720	“ “ “ “	Truckers’ Favorite	Baltimore
2931	Baltimore Seed & Implement Co.. Baltimore, Md.	Special Potato Fertilizer.	Baltimore
2869	Baugh & Sons Co., Baltimore, Md.	Ammoniated Dissolved Animal Bone	Williamsport
2723	“ “ “ “	Animal Bone and Potash Compound.	Baltimore
2680	“ “ “ “	Bone Meal	Beltsville
2753	“ “ “ “	Corn Fertilizer for Sugar Corn & Garden Truck	Baltimore
2679	“ “ “ “	Double Eagle Phosphate	Beltsville
2752	“ “ “ “	Export Bone with Potash	Baltimore
2706	“ “ “ “	Fine Ground Fish	Baltimore
2713	“ “ “ “	Fish Mixture	Baltimore
2725	“ “ “ “	General Crop Grower	Baltimore
2681	“ “ “ “	Genuine German Kainit	Beltsville
2666	“ “ “ “	H. G. Acid Phosphate or Dissolved S. C. Rock	Baltimore

Maryland Agricultural College, March to July, 1896.

No.	NITROGEN Calculated as AMMONIA.		POTASH, K₂O.		PHOSPHORIC ACID.					Comparative Valus per Ton Found.	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.	Insoluble Found.	**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2870	....	......	....	......	.86	14.16	14	15.02	15½	$14.16	$14.00
2818	1.10	1	1.00	1.	2.94	10.39	9	13.33	10	18.53	15.40
2764	1.82	1½	2.39	2	1.97	8.52	8	10.49	10	19.25	17.30
2709	2.34	2½	4.29	3	1.78	7.82	9	9.60	11	21.76	22.50
2694	.82	½	1.80	1	1.34	9.47	10	10.81	12	16.42	15.70
2690	....	....	2.14	2	1.31	10.95	10	12.26	12	13.62	12.80
2904	....	.... .	...	....	1.42	14.01	14	15.43	15	14.01	14.00
2692	....	....	3.42	4½	1.69	9.67	7	11.36	7	13.76	11.50
2720	5.94	8	4.10	5	2.44	6.83	9	9.27	....	31.58	39.80
2931	1.78	1½	3.68	4½	1.91	6.99	6½	8.90	7½	18.56	17.40
2869	2.22	2	...	....	3.11	9.49	8	12.60	10	19.92	16.80
2723	2.52	2	2.29	2	2.13	8.90	8	11.03	10½	21.81	19.10
2680	5.03	4	...	.... ..	....		.. ...	21.80	21½	29.43	....
2753	2.27	2	......	......	3.21	8.84	8	12.05	11	19.35	17.40
2679	2.63	2½	.86	½	2.40	9.44	8	11.84	10½	21.52	19.10
2752	2.52	2	2.00	2	4.21	9.38	11	13.59	11	23.35	21.20
2706	10.78	10		....	.....	...	......	8.46	....	37.42	30.00
2713	2.30	2	3.02	2	2.40	9.73	8	12.13	10	23.04	18.80
2725	2.09	1	1.94	1	2.71	8.73	8	11.44	10½	20.32	15.10
2681	12.28	12	. .....	......	....		......	...	....	12.28	12.00
2666	...	....	.....	.. ....	.99	15.04	14	16.03	15	15.04	14.00

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2722	Baugh & Sons Co., Baltimore, Md.	H. G. Potato Guano	Baltimore
2673	" " " "	H. G. Tobacco & Truck	Baltimore
2687	" " " "	Muriate of Potash	Beltsville
2688	" " " "	New Process Tankage	Beltsville
2714	" " " "	New Process 10 per cent. Guano.	Baltimore
2718	" " " "	Old Standby Raw Bone Super Phosphate.	Baltimore
2693	" " " "	Potato Fertilizer	Baltimore
2872	" " " "	Pure Animal Bone and Mur. of Potash Mixture.	Cumberland
2678	" " " "	Pure Dis Animal Bone	Beltsville.
2912	" " " "	S. N. Hyde's Special Compound.	Baltimore
2817	" " " "	Soluable Alkaline Super-Phosphate.	Sykesville
2711	" " " "	Special Potato Manure	Baltimore
2744	" " " "	Strawberry Mixture	Baltimore
2689	" " " "	10 Per Cent. Tankage	Beltsville.
2898	William Benders, Miller's, Md.	Bone	Alesia
2842	Bumfield & Foster, Colora, Md.	B. & F. Ammoniated Bone Phosphate.	Notrh East
2762	J. Bullock & Son, Baltimore, Md.	Dis. Pure Raw Bone	Baltimore
2911	" " "	Pure Ground Raw Bone	Baltimore
2895	Chemical Co. of Canton, Baltimore, Md.	Baker's Dis. Bone Phosphate.	Alesia
2868	" " "	Baker's Standard Bone	Fallston
2702	" " "	Dis. S. C. Bone	Baltimore

Maryland Agricultural College, March to July, 1896, Continued.

No.	NITROGEN Calculated as AMMONIA.		POTASH, K_2O.		PHOSPHORIC ACID.					Comparative Value per Ton Found.	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.	Insoluble Found.	**Found.**	Guaranteed.	**Found.**	Guaranteed		
2722	**5.76**	5	**5.37**	5	1.95	**11.03**	8	**12.98**	10½	**$37.06**	$31.10
2673	**3.64**	3	**3.33**	3	2.35	**10.31**	8	**12.66**	10	**28.03**	22.20
2687	....	....	**50.56**	50	....	....	....	..	....	**50.56**	50.00
2688	**12.88**	....	....	....	.32	**.50**	....	**.82**	....	**31.40**	......
2714	**10.51**	10	**3.52**	2½	1.80	**6.37**	5	**8.17**	7	**43.77**	39.70
2718	**2.47**	2	**1.51**	1	1.50	**9.95**	8	**11.45**	10½	**21.76**	18.10
2693	**2.42**	2	**2.00**	2	2.30	**9.15**	8	**11.45**	10	**21.62**	18.80
2872	**4.09**	....	**4.92**	....	7.59	**11.68**	....	**19.27**	....	**35.74**	......
2678	**3.87**	3	....	....	2.38	**14.53**	11	**16.91**	16	**30.39**	25.20
2912	**2.69**	....	**3.86**	....	3.39	**8.42**	....	**11.81**	....	**24.06**	......
2817	....	....	**2.11**	2	.77	**11.20**	10	**11.97**	....	**13.62**	12.00
2711	**2.84**	2	**10.15**	10	2.24	**6.48**	5	**8.72**	7½	**27.94**	23.50
2744	**4.08**	4	**4.66**	5	2.36	**7.97**	7	**10.33**	10	**27.88**	27.20
2689	**9.85**	10	....	....	3.13	**4.89**	....	**8.02**	....	**28.45**	24.00
2898	**5.13**	....	....	....	7.97	**8.30**	....	**16.27**	....	**30.13**	......
2842	**2.01**	2	**2.01**	2	1.20	**10.89**	9	**12.09**	10	**21.83**	19.40
2762	**3.37**	3.67	....	....	4.26	**12.30**	12.30	**16.56**	....	**27.43**	25.77
2911	**5.26**	4.92	....	....	....	....	....	**20.86**	25.20	**26.04**	.....
2895	**.46**	¼	....	....	1.89	**14.04**	13	**15.93**	....	**19.36**	16.35
2868	**5.55**	....	....	....	.....	....	....	**19.78**	....	**30.94**	......
2702	....	....	....	....	1.74	**13.78**	13	**15.52**	15	**13.78**	13.00

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2896	Chemical Co of Canton. Baltimore, Md.	Potato Manure	Alesia
2905	" " "	Red Clover	Green Mount
2867	" " "	Special Potato Manure	Fallston
2915	" " "	Special Wheat, Corn and Oats Mixture.	Baltimore
2897	" " "	Truckers' Delight	Alesia
2851	R. L. Christie, Baltimore, Md.	Christie's Special for Corn and Oats.	Colora
2853	" " "	Farmers' Famous Bone Phosphate	Colora
2848	" " "	Soluble Bone and Potash.	Colora
2852	" " "	Special Potato and Vegetable.	Colora
2850	" " "	Sure Crop Ammoniated Phosphate	Colora
2849	" " "	Unexcelled Acid Phosphate.	Colora
2844	E. A. Clendennin & Bro., Colora, Md.	Farmers' Favorite Vegetator.	Colora
2843	" " "	H. G. Acid Phosphate	Colora
2845	" " "	National Standard	Colora
2846	" " "	Pure Raw Bone	Colora
2847	" " "	Special Potato and Truck.	Colora
2860	Josiah Cope, Lincoln University, Pa.	Acidulated Phosphate	Rising Sun
2862	" " " "	Potato and Tobocco Phosphate.	Rising Sun
2863	" " " "	Ammoniated Bone Phosphate.	Glen Cove
2859	" " " "	Pure Standard Bone	Rising Sun
2861	" " " "	Try Me Bone Phosphate..	Rising Sun

Maryland Agricultural College, March to July, 1896, Continued.

No.	NITROGEN Calculated as AMMONIA.		POTASH, K_2O.		PHOSPHORIC ACID.					Comparative Value per Ton Found.	Comparative Value per Ton Guaranteed.
					Insoluble Found.	Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.		**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2896	1.26	1	4.74	4½	.99	9.81	8	10.80	10	$20.88	$18.30
2905	1.09	1	2.27	2	1.50	6.16	5	7.66	6	13.83	11.60
2807	3.17	3	10.40	9	.82	6.97	6	7.79	....	28.76	25.20
2915	1.32	1	2.34	2	2.60	8.39	9	10.99	11	17.93	17.00
2897	6.00	6	4.30	4	1.21	8.23	8	9.44	8	32.91	31.61
2851	2.12	2	2.00	2	1.51	10.53	13	12.04	16	21.91	25.40
2853	1.21	1	2.47	2	1 26	8.96	8	10.22	10	17.61	15.80
2848	....	....	2.00	2	1.05	12.11	11	13.16	13	14.53	13.80
2852	2.50	2½	3.45	3	1.42	9.13	10	10.55	13	22.76	24.30
2850	1.18	1	3.11	3	1.21	9.19	11	10.40	13	18.41	20.40
2849	....	....	..	....	.97	15.05	14	16.02	16	15.05	14.00
2844	1.43	1	1.06	1	1.34	9.72	8	11.06	9	17.81	14.20
2843	....	......	..	......	.94	14.85	14	15.79	... ...	14.85	14.00
2845	1.94	1½	1.67	1½	2.73	10.89	10	13.62	13	22.20	19.80
2846	4.85	4	..	....	......	......	......	23.07	22	25.30	.....
2847	3.22	3	6.31	6	.76	8.41	6	9.17	....	26.52	22.20
2860	...	....	....	... ...	1.46	14.58	13	16.04	... ..	14.58	13.00
2862	1.55	1½	7.00	7	.79	12.09	10	12.88	12	26.63	24.70
2863	1.26	1	4.51	2	2.96	8.50	7	11.46	9	20.27	14.60
2859	2.82	2	..	.....	.. .	.. ..	......	24.65	24	28.03	......
2861	1.56	1½	3.53	2	1.75	8.97	7	10.72	9	20.02	16.10

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizers.	Place of Sampling.
2828	Crocker Fert. & Chemical Co., Buffalo, N Y.	Ammoniated Wheat and Corn Phosphate.	Walkersville
2824	" " "	Animal Bone and Potash	Walkersville
2907	" " "	New Rival Ammoniated Superphosphate.	Maple Grove
2887	" " "	Niagara Phosphate	Westminster
2908	" " "	Potato, Hop and Tobacco	Maple Grove
2906	" " "	Practical Ammoniated Superphosphate.	Maple Grove
2760	Wm Davidson & Co., Baltimore, Md.	"Boss" Ammoniated Superphosphate.	Baltimore
2761	" " " "	Dissolved S. C. Bone	Baltimore
2866	" " " "	H. G. Ammoniated Superphosphate.	Bel Air
2691	" " " "	Penn Mar Ammoniated Bone Phosphate.	Baltimore
2774	L. E. P. Dennis & Son, Crisfield, Md.	Fish Mixture No. 1	King's Creek
2924	Detrick Fertilizer & Chemical Co., Baltimore, Md.	Ammoniated Superphosphate Vegetator.	Locust Point
2926	" " "	Corn Fertilizer	Locust Point
2715	" " "	Dissolved S. C. Bone	Baltimore
2829	" " "	Farmers' New Method	Germantown
2923	" " "	Imperial Compound	Baltimore
2925	" " "	P. & B. Special Fertilizer.	Locust Point
2729	" " "	Potato Fertilizer	Baltimore
2832	" " "	Pure Fine Ground Animal Bone.	Silver Spring
2814	J. W. Dorsey, Ellicott City, Md.	Ammoniated Superphosphate.	Ellicott City
2813	" " " "	Stag Potato Phosphate	Ellicott City

Maryland Agricultural College, March to July, 1896, Continued.

No.	NITROGEN Calculated as AMMONIA.		POTASH, K_2O.		PHOSPHORIC ACID.					Comparative Value per Ton Found.	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	Found.	Guaranteed.	Insoluble Found.	Found.	Guaranteed.	Found.	Guaranteed.		
2828	3.10	2½	3.24	1.60	1.67	10.12	10	11.79	10	$25.68	$21.70
2824	2.57	1½	3.54	1	1.05	10.16	12	11.21	12	24.07	19.90
2907	1.62	1½	1.95	1	2.13	10.26	10	12.39	10	20.40	18.10
2887	.....	....	....	....	2.57	12.50	11½	15.07	11½	12.50	11.50
2908	2.56	2½	3.71	3½	1.11	10.39	10	11.50	10	24.53	23.35
2906	1.39	1	1.49	1.08	4.45	8.08	8	12.53	9	18.03	14.28
2760	2.81	2½	2.39	2½	3.57	10.02	8	13.59	11	24.98	21.40
2761	....	....	....	....	2.49	13.32	13	15.81	16	13.32	13.00
2866	3.05	2.15	2.83	2.75	1.27	11.85	10	13.12	13	24.96	23.00
2691	1.93	1.40	2.73	2½	3.51	9.29	8	12.80	10	21.78	17.50
2774	3.02	3½	4.01	3½	3.26	7.30	....	10.56	7	23.79	22.40
2924	2.65	2½	1.71	1½	2.15	10.20	10	12.35	12	23.19	22.20
2926	1.24	1	2.16	2	2.68	10.05	10	12.73	11	19.55	17.60
2715	.....	....	......	....	.65	15.34	14.	15.99	15	15.34	14.00
2829	2.68	2½	......	....	2.46	9.06	8	11.52	9	20.39	17.70
2923	1.24	1	1.16	1	1.84	9.04	9	10.88	10½	16.83	15.70
2925	.....	....	3.23	3½	1.75	10.85	9	12.60	10	14.78	12.90
2729	2.14	2½	3.91	4	1.93	9.70	8	11.63	9	23.13	21.70
2832	4.72	4½	......	....	.....	....	....	22.05	20½	26.67	
2814	2.31	2	2.12	2	2.42	9.31	8	11.73	....	21.67	17.60
2813	3.08	3	4.18	4	2.14	9.82	9	11.96	11	26.48	25.00

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2918	P. P. Dunan, Baltimore, Md.	Ammoniated Alkaline Guano	Baltimore
2696	" " "	Corn and Oats	Baltimore
3276	Wm. Elliott & Sons, New York.	Concentrated Plant Fertilizer.	Baltimore
2891	D. Englar, Jr., Linwood, Md.	No 1 Ammoniated Bone Phosphate.	Linwood
2890	" " "	No. 2 Ammoniated Bone Phosphate.	Linwood
2834	Eureka Fertilizer Co., Perryville, Md.	Alkaline Bone and Potash.	Perryville
2833	" " "	Corn and Potato Special.	Perryman
2837	" " "	Farmers' Favorite	Perryville
2835	" " "	Fine Ground Bone	Perryville
2836	" " "	P. & P. Superphosphate.	Perryville
2858	" " "	Pure Dissolved Bone	Rising Sun
2857	" " "	Raw Bone Phosphate	Rising Sun
2671	Excelsior Guano Co., Baltimore Md.	Excelsior Peruvian Guano	Baltimore
2882	Farmers' Fertilizer Co., Westminster, Md.	No 2 Bone Phosphate	Westminster
2881	" " "	No. 3 Bone Phosphate	Westminster
2880	" " "	XX Bone Phosphate	Westminster
2874	W. S. Farmer & Co., Baltimore, Md.	B. & P. Fertilizer	Cumberland
2751	" " " "	Clyde Brand	Baltimore
2875	" " " "	Dissolved Raw Bone	Cumberland
2873	" " " "	Dissolved S. C. Bone	Cumberland
2748	" " " "	Harvest Queen	Baltimore

Maryland Agricultural College, March to July, 1896, Continued.

No.	NITROGEN Calculated as AMMONIA.		POTASH, K_2O.		PHOSPHORIC ACID.					**Comparative Value per Ton Found.**	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.	Insoluble Found.	**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2918	1.89	2	1.78	1	4.99	9.43	8	14.42	... .	$21.76	$16 60
2696	2.75	2	1.79	2	1 97	9.29	8	11.26	9	22.37	18 20
3276	2.89	....	1.39	... ...	.26	1.76	....	2.02	....	12.33	.....
2891	2.22	2½	1.39	1.34	1.32	12.10	11.31	13.42	....	23.36	22.41
2890	1.14	1.80	2.34	1.83	2 30	10.25	11.99	12.55	....	19 44	21 62
2834	....	... .	2.16	2	3.06	11.58	11	14.64	12	14.96	13.40
2833	1.15	1	2.37	3	4 05	10.37	9	14.42	11	20.69	18 00
2837	1.59	2	2.10	2	3.94	10.29	10	14.23	12	21.58	21 20
2835	4.29	4	....	....	....	....	....	20.82	22	26.01	.....
2836	....	....	....	....	2.30	14.27	14	16.57	15	14.27	14 00
2858	1.83	2	....	....	4.90	13.96	12	18.86	15	25.18	22.20
2857	1.70	2	2.04	2	4.37	10.05	10	14.42	13	21.82	21 80
2671	4.41	....	3.77	... ...	.61	9.79	10	10.40	......	29.12	......
2882	2.01	2	3.24	2½	1 67	9.28	9	10.95	10	21.41	19.90
2881	1.75	1¾	2.97	2½	1.79	9.19	9	10.98	11	20.38	19.75
2880	1.01	1	3.55	3½	1.07	9.22	9	10.28	10	18.27	17.90
2874	....	....	2.53	2½	1.08	11.83	10	12.91	11	14.79	12 90
2751	1.25	1	2.84	2½	1.26	9.04	9	10.30	10	18.20	16 90
2875	2.81	2½	....	....	3 09	12.60	12	15.69	15	25.40	23.70
2873	....	....	....	....	.76	15.16	14	15.92	15½	15.16	14 00
2748	1.71	1½	2.98	2½	1 07	10.08	10	11.15	11½	20.85	19 90

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2749	W. S. Farmer & Co., Baltimore, Md.	Potato Compound	Baltimore
2743	“ “ “ “	No. 2 Potato Manure	Baltimore
2719	“ “ “ “	No. 1 Potato Manure	Baltimore
2747	“ “ “ “	Pure Bone Meal	Baltimore
2750	“ “ “ “	Standard Phosphate	Baltimore
2721	“ “ “ “	10 per cent. Vegetable Guano.	Baltimore
2884	N. I. Gorsuch & Son, Westminster, Md.	Dissolved Raw Bone Phosphate.	Westminster
2883	“ “ “ “	Peerless Fertilizer	Westminster
2885	“ “ “ “	Westminster No. 3 Bone XXXX.	Westminster
2900	Griffith & Boyd, Baltimore, Md.	Ammoniated Bone Phosphate.	Fowblesburg
2746	“ “ “ “	Ammoniated Soluble Bone.	Baltimore
2901	“ “ “ “	Cereal Bone Plant Food	Fowblesburg
2815	“ “ “ “	H. G. Acid Phosphate	Ellicott City
2919	“ “ “ “	Soft Ground Bone	Baltimore
2930	“ “ “ “	Spring Crop Grower	Baltimore
2717	Wm. R. Griffith, Baltimore, Md.	The Trucker “G” Phosphate.	Baltimore
2734	Griffith, Turner & Co., Baltimore, Md.	Ammoniated Alkaline Plant Food.	Baltimore
2735	“ “ “	Ammoniated Alkaline Plant Food.	Baltimore
2686	“ “ “	Ammoniated Butchers' Bone Phosphate.	Beltsville
2682	“ “ “	Dissolved Bone	Beltsville
2684	“ “ “	Ground Bone	Beltsville

Maryland Agricultural College, March to July, 1896, Continued.

No.	NITROGEN Calculated as AMMONIA.		POTASH, K₂O.		PHOSPHOHIC ACID.					Comparative Value per Ton Found.	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	Found.	Guaranteed.	Insoluble Found.	Found.	Guaranteed.	Found.	Guaranteed.		
2749	1.72	1½	3.21	2½	1.05	10.16	10	11.21	11½	$21.19	$19.90
2743	3.05	3	2.81	2	1.24	8.91	8	10.15	9	23.39	21.20
2719	4.88	4½	8.10	7	1.14	6.90	8	8.04	9	31.70	30.70
2747	4.01	4	....	....	...	....	....	23.48	22	27.01	.....
2750	3.37	2 85	2.95	2½	1.67	9.02	10	10.69	11	24.88	23.65
2721	8.88	10	3.48	3	1 26	6.48	6	7.74	7	38.66	40.80
2884	1.67	1.40	2.25	2½	1.37	6.64	7	8.01	8	16.05	15 45
2883	....	....	2.11	2	1 54	8.42	8	9.96	9	11.15	10.40
2885	.41	.25	1.51	1½	1.76	8.55	8	10.31	9	14.06	12.45
2900	2.26	2	1.80	1½	2 34	9.51	9	11.85	10	21.39	18.90
2746	1.02	1	2.08	1½	2 30	6.88	7	9.18	8	14.78	13 50
2901	1.37	1	2.33	1½	2.29	9.03	8	11.32	10	18.65	15.30
2815	....	....	....	....	1 54	13.01	14	14.55	15.	13.01	14.00
2919	3.59	3	....	....	9 30	7.56	....	16.86	11	25.42	22.20
2930	1.83	2	3.78	4½	1.59	7.94	7	9.53	8	19.75	19 50
2717	5.18	4½	2.91	2½	1 56	6.87	5	8.43	7½	27.63	23.50
2734	1.42	1	2.42	1½	2 80	7.20	6½	10.00	7½	17.00	12.90
2735	1.32	1	2.41	1½	2.71	6.80	6½	9.51	7½	16.16	12.90
2686	1.56	1½	2.53	1½	2 60	7.82	9	10.42	10	18.03	17.40
2682	2.35	2	.....	....	2.72	9.99	9	12.71	10	20.67	17.40
2684	4.87	4	....	....	... .	.....	....	23.89	20½	25.70	......

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2683	Griffith, Turner & Co., Baltimore, Md.	H. G. Acid Phosphate......	Beltsville ....
2759	" " "	Soft Ground Bone............	Baltimore....................
2894	" " "	Soluble Bone Phosphate..	Glyndon ....
2928	Griffith & Lytle, Baltimore Md.	Standard Bone Phosphate	Baltimore....................
2830	S. M. Hess & Bro., Philadelphia, Pa.	Potato and Truck Manure.	Gaithersburg. ....
2732	Joshua Horner, Jr., & Co., Baltimore, Md.	Ammoniated Raw Bone Superphosphate.	Baltimore............ ....
2704	" " "	Dissolved Slaughter House Bone Dust.	Baltimore....................
2705	" " "	Slaughter House Bone Dust.	Baltimore ....
2731	" " "	The Cultivator..................	Baltimore......................
2839	Hubbard & Co., Baltimore, Md.	Buyers' Special Mixture..	North East. ....
2737	" " "	Columbia Gem..........	Baltimore....................
2739	" " "	Dissolved Raw Bone.........	Baltimore....................
2712	" " "	IXL Superphosphate........	Baltimore....................
2697	" " "	H. G. Soluble S. C. Phosphate.	Baltimore....................
2821	" " "	Oriental Phosphate for Wheat and Grass.	Mt. Airy.......................
2816	" " "	Soluble Bone and Potash.	Baltimore ....
2736	" " "	Standard Bone Superphosphate.	Baltimore.....................
2766	" " "	Truckers' 7 per cent. Royal Seal Compound	Cambridge.................
2738	" " "	Western Ground Bone.....	Baltimore....................
2822	" " "	Wheat Growers' Jewel	Mt. Airy........................
2856	M. P. Hubbard & Co., Baltimore, Md.	Ammoniated Bone and Potash.	Rising Sun..................

Maryland Agricultural College, March to July, 1896, Continued.

No.	NITROGEN Calculated as AMMONIA.		POTASH, K₂O.		PHOSPHORIC ACID.					Comparative Value per Ton Found.	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.	Insoluble Found.	**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2683	....	....	....	....	1.34	**13.85**	14	**15.19**	15	**$13.85**	$14.00
2759	**4.71**	4	....	......	5.30	**7.15**	10	**12.45**	11	**25.89**	24.60
2894	....	....	**1.70**	1½	1.45	**10.18**	9	**11.63**	10	**12.46**	10.90
2928	**1.82**	2	**2.75**	1½	2.29	**9.58**	9	**11.87**	10	**21.08**	18.90
2830	**2.37**	2	**6.31**	6	.71	**9.86**	8	**10.57**	......	**25.68**	21.60
2732	**2.57**	2½	**2.15**	2½	1.99	**8.73**	8	**10.72**	12	**21.53**	22.00
2704	**3.12**	2½	....	....	2.63	**10.43**	12	**13.06**	15	**23.46**	23.70
2705	**6.67**	6	.....	......	.....	.....	....	**19.45**	20	**27.23**	......
2731	**1.45**	2½	**1.81**	2½	2,28	**9.25**	7	**11.53**	9	**18.63**	19.60
2839	**2.95**	....	**3.67**	....	1.42	**8.37**	....	**9.79**	....	**23.41**	......
2737	**.85**	½	**1.58**	1½	1.52	**9.11**	8	**10.63**	10	**15.97**	13.80
2739	**2.76**	2.75	....	....	2.11	**10.64**	10	**12.75**	10½	**22.32**	20.55
2712	**2.18**	2	**2.28**	1¾	1.69	**7.97**	7	**9.66**	8½	**19.39**	17.05
2697	....	....	....	....	2.40	**13.78**	14	**16.18**	....	**13.78**	14 00
2821	**1.44**	2	**1.60**	1½	1.66	**8.80**	8	**10.46**	10	**17.48**	18.30
2716	....	....	**1.83**	2	1.63	**10.98**	10	**12.61**	11½	**13.46**	12.60
2736	**2.31**	2	**2.26**	2	.89	**10.32**	9	**11.21**	10	**22.10**	19.40
2766	**6.38**	7	**4.83**	4	3.31	**6.67**	5	**9.98**	....	**33.96**	31.00
2738	**2.73**	3	....	....	....	.....	....	**17.64**	14	**14.79**	......
2822	**1.61**	1½	**1.74**	1½	2.11	**9.53**	10	**11.64**	11	**19.28**	18.60
2856	**1.05**	1	**2.22**	1½	1.81	**8.09**	8	**9.90**	9½	**16.17**	15.00

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2812	M. P. Hubbard & Co., Baltimore, Md.	Celebrated Bone Superphosphate.	Jessups
2695	" " "	Farmers' Acme Fertilizer.	Baltimore
2854	" " "	Farmers' Old Economy	Rising Sun
2811	" " "	Genuine Pure Raw Bone	Jessups
2855	" " "	Harvest King for Wheat and Grass.	Rising Sun
2727	" " "	H. G. Soluble S. C. Phosphate.	Baltimore
2902	" " "	Soluble Bone and Potash	Fowblesburg
2728	Randolph Humphreys, Salisbury, Md.	Our Fish Mixture	Baltimore
2758	" "	Our Mixture B	Baltimore
2876	C. M. Keedy, Keedysville, Md.	Bone Meal	Keedysville
2877	" " "	Money Saving Fertilizer	Keedysville
2742	S. L. Lamberd Co, Baltimore, Md.	Boss Fertilizer	Baltimore
2763	" " "	Special Potato Grower	Baltimore
2819	Lazaretto Guano Co., Baltimore, Md.	Alkaline Phosphate	Mt Airy
2903	" " "	Ammoniated Bone Phosphate.	Hampstead
2888	" " "	Pure Dissolved Animal Bone.	Medford
2820	" " "	Pure Dissolved S. C Bone.	Mt. Airy
2878	Lister Agr'l and Chemical Co., Newark, N. J.	Ammoniated Dissolved Bone.	Chewsville
2806	" " "	Celebrated Ground Bone	Laurel
2710	" " "	Harvest Queen Phosphate.	Baltimore
2838	" " "	I Increase Crescent Bone Dust.	North East

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No.	NITROGEN Calculated as AMMONIA.		POTASH, K_2O.		PHOSPHORIC ACID.					Comparative Valus per Ton Found.	Comparative Value per Ton Guaranteed.
					Insoluble Found.	Available.		Total.			
	Found.	Guaranteed.	Found.	Guaranteed.		Found.	Guaranteed.	Found.	Guaranteed.		
2812	2.72	2½	2.13	2	1.76	10.87	9	12.63	10½	$24.39	$21.20
2695	2.05	2	2.25	2	1.82	8.68	7	10.50	8½	19.91	17.30
2854	.80	½	1.93	1½	1.69	8.12	8	9.81	10	15.09	13.80
2811	4.61	4	....	....	....	....	....	20.09	20½	24.47	......
2855	1.36	1½	2.02	1½	1.23	9.88	9	11.11	10½	18.70	17.70
2727	....	....	....	....	.95	14.78	14	15.73	....	14.78	14.00
2902	.....	....	2.07	2	1.25	9.34	9	10.59	11	11.91	11.80
2728	2.34	2½	1.33	1	3.61	8.89	8	12.50	9	21.19	18.70
2758	2.69	3	1.65	1½	1.57	10.62	8	12.19	9	23.40	20.70
2876	2.40	2	...	....	....	...	....	24.66	23	26.93	......
2877	.97	1½	3.74	3	2.99	9.05	9	12.04	....	19.30	18.30
2742	3.55	4	.72	1	2.84	7.67	7	10.51	9	22.27	22.60
2763	1.98	1½	4.57	4½	2.45	8.20	7	10.65	8	22.73	18.00
2819	....	....	2.08	2	1.04	11.25	11	12.29	....	13.75	13.00
2903	1.07	1	2.26	2	1.73	9.08	9	10.81	....	17.41	15.80
2888	2.60	2½	...	....	1.47	12.27	15	13.74	17	23.40	26.70
2820	.....	....	....	....	1.24	14.15	14	15.39	....	14.15	14 00
2878	2.26	2.20	1.69	1½	2.72	10.03	9	12.75	11	22.14	20.10
2806	3.74	3¼	....	....	5.79	8.13	......	13.93	12	24.46	16.95
2710	2.06	1	2.22	2	2.34	10.37	9.20	12.71	11.20	22.24	17.24
2838	3.38	2¾	....	....	8.62	6.30	....	14.92	11	22.87	14.85

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2927	Lister Agr'l and Chemical Co., Newark, N. J.	Potato No. 2 Fertilizer	Baltimore
2726	" " "	Special Potato Fertilizer.	Baltimore
2667	" " "	Standard Pure Bone Superphosphate.	Baltimore
2803	T. H. Longfellow, Greensboro, Md.	Farmers' Delight No. 1	Greensboro
2804	" " "	Farmers' Delight No. 2	Greensboro
2921	Mape's Formula and Peruvian Guano Co., N. Y.	Complete Manure for Light Soils.	Baltimore
2920	" " " "	Manure for Potatoes	Baltimore
2937	Md. Grange Agency, Baltimore, Md.	Corn and Potato Phosphate.	Baltimore
2733	" " " "	Dissolved S. C. Bone	Baltimore
2910	Wm. McKenney, Centreville, Md.	Corn Fertilizer.	Baltimore
2810	Md. Fertilizer Co., Baltimore, Md.	Bone Superphosphate	Laurel
2932	" " " "	Dissolved Phosphate	Baltimore
2808	" " " "	Globe Complete Manure.	Laurel
2745	" " " "	Linden Superphosphate	Baltimore
2809	" " " "	Potato Food	Laurel
2892	" " " "	Pure Dissolved Animal Bone.	Linwood
2670	" " " "	Sangston's Cereal and Plant Food.	Baltimore
2889	Medford Fertilizer Co. Medford, Md.	No. 3 Bone Phosphate	Medford
2893	F. Mehring, Bruceville, Md.	No. 2 Ammoniated Snperphosphate.	Bruceville
2917	Miller Fertilizer Co., Baltimore, Md.	Ammoniated Dissolved Bone Phosphate.	Baltimore
2899	" " " "	Clinch Phosphate	Fowblesburg

Maryland Agricultural College, March to July, 1896, Continued.

No.	NITROGEN Calculated as AMMONIA.		POTASH, K_2O.		PHOSPHORIC ACID.					Comparative Value per Ton Found.	Comparative Value per Ton Guaranteed.
	Found.	Guaranteed.	Found.	Guaranteed.	Insoluble Found.	Available.		Total.			
						Found.	Guaranteed.	Found.	Guaranteed.		
2927	2.63	2.20	4.29	4	1.34	11.59	9¼	12.93	....	$26.89	$21.70
2726	2.08	2	3.55	3	2 43	9.48	8	11.91	9	22.63	19.20
2667	3.07	2.85	2.20	1½	2.50	10.30	10	12.80	12	25.27	23.25
2803	.78	1	2.10	2	1.12	8.45	8	9.57	9	15.25	15.20
2804	.55	½	1.80	1	.97	6.92	8	7.89	9	12.33	12.70
2921	6.02	6	7.44	6	1.76	7.37	6	9.13	8	35.40	32.40
2920	4.80	4½	7.57	6	2.05	8.50	8	10.55	8	34.19	29.10
2937	1.20	1	2.39	2¼	1.55	10.25	9	11.80	10	19.22	17.65
2733	....	....	....	....	.22	16.09	14	16.31	....	16.09	14.00
2910	.31	......	1.13	....	1.55	11.17	....	12.72	....	16.39	.....
2810	....	....	2.13	2	1.94	11.84	10	13.78	11	14.75	12.40
2932	....	....	....	....	2.60	14.07	14½	16.67	15½	14.07	14 50
2803	2.12	2	1.87	1½	4.41	7.58	9	11.99	10	19.99	18.90
2745	....	....	2.45	2½	2.16	11.77	11	13.93	12	15.08	13.90
2809	2.26	2¼	10.17	10	2.65	8.83	6	11.48	7½	31.17	24.85
2892	3.27	2½	.....	....	4.03	11.34	12	15.37	....	25.86	21.90
2670	1.53	1¼	2.24	2¼	4.19	9.49	10	13.68	11	20.73	18.60
2889	1.40	1	2.48	2¾	1.14	9.81	5	10.95	....	19.13	11.75
3893	1.69	1	1.00	¾	2.50	11.76	9	14.26	....	21.68	14.55
2917	2.94	2¼	2.53	2¼	1.57	10.73	9	12.30	10½	25.17	20 70
2899	1.13	1	1.93	1½	1 68	7.98	7	9.66	9	15.91	14.10

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2756	Miller Fertilizer Co., Baltimore, Md.	Dissolved Raw Bone	Baltimore
2865	" " " "	Dissolved S. C. Bone	Cambria
2754	" " " "	Ground Bone	Baltimore
2700	" " " "	Harvest Queen Phosphate	Baltimore
2755	" " " "	Hustler Phosphate	Baltimore
2701	" " " "	No. 1 Potato Phosphate	Baltimore
2741	" " " "	No. 2 Potato Fertilizer	Baltimore
2929	" " " "	Pure Bone Meal	Baltimore
3213	" " " "	Robinson's Tomato Grower.	Fallston
2864	" " " "	Special Potato Fertilizer	Cambria
2740	" " " "	Special Tomato Grower	Baltimore
2669	" " " "	Standard Superphosphate of Lime.	Baltimore
2823	" " " "	Sulivan's Sure Success	Monrovia
2879	H. S. Miller & Co., Newark, N. J.	Ammoniated Dissolved Bone Phosphate.	Chewsville
2668	Monumental Chemical Co., Baltimore.	Monumental Potato Manure.	Baltimore
2672	W. H. Moore & Co., Baltimore, Md.	Special for Tobacco Beds	Baltimore
2724	G. R. Mowell, Glencoe, Md.	Dissolved S. C. Rock	Baltimore
2922	Mt. Airy Manufacturing Co., Baltimore, Md.	Garden and Truck Fertilizer.	Baltimore
2936	" " "	Insula Guano	Baltimore
2799	" " "	Mixture	Denton
2699	" " "	Piedmont Potato Producer.	Baltimore

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No.	NITROGEN Calculated as AMMONIA.		POTASH, K₂O.		PHOSPHORIC ACID.					Comparative Value per Ton Found.	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.	Insoluble Found.	**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2756	2.72	2½	....	......	1 44	11.71	11	13.15	14	$23.07	$22.50
2865	.....	....	.....	....	1 59	15.09	14	16.68	....	15.09	14.00
2754	3.11	3	....	......	.. .	....	....	16.90	15.	20.96	.....
2700	1.48	1¼	2.59	2¼	1.80	11.26	10	13.06	11½	21.62	18.90
2755	1.23	1	2.72	2¼	1.25	9.96	9	11.21	10	19.11	16.65
2701	4.77	4½	7.32	7	1.42	8.13	8	9.55	9	32.26	30.70
2741	2.25	2	4.12	4	1.40	8.74	8	10.14	9	22.20	20.20
2929	3.60	4.	....	....	....	....	....	26.40	20	30.37	.....
3213	3.78	4	4.43	2¼	3 91	6.61	10.	10.52	....	26.05	26.25
2864	.83	1	5.09	5	1.74	8.05	7	9.79	9	18.28	17.60
2740	3.00	3	3.30	3	1.69	8.58	8	10.27	9½	23.61	22.50
2669	2.87	2.85	2.33	2¼	2.91	10.86	10	13.77	11½	24.72	24.00
2823	2.01	2	2.42	2	1.66	8.85	8	10.51	9½	20.07	18.50
2879	2.59	2.55	.....	....	2 31	9.68	10	11.99	11½	20.78	20.55
2668	1.20	1	4.52	4	5 04	8.74	6	13.78	7	23.63	14.80
2672	7.07	7	2.46	2	.60	6.56	5	7.16	....	31.90	29.00
2724	.....	....	....	....	1.20	13.56	14	14.76	15	13.56	14.00
2922	4.36	3	3.15	3	1.63	8.67	8	10.30	....	27.61	21.60
2936	.52	½	2.20	2	1.30	5.21	5	6.51	7	10.79	10.70
2799	1.31	....	1.84	....	1.81	4.30	....	6.11	....	12.02	.....
2699	3.13	3	5.79	6	1 77	6.80	5	8.57	7	24.40	22.20

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2707	Mt. Airy Manufacturing Co., Baltimore, Md.	Piedmont Pure Raw Bone Mixture.	Baltimore
2703	" " "	Piedmont Special for Tobacco Beds.	Baltimore
2913	" " "	Piedmont Star Soluble Bone and Potash.	Baltimore
2698	" " "	S. C. Bone Phosphate	Baltimore
3134	Natural Plant Food Co., Washington, D. C.	Natural Plant Food	Baltimore
3113	J. B. Nichols & Son, Baltimore, Md.	Farmers' Friend Guano	Baltimore
3257	Nickerson Fertilizer Co., Easton, Md.	Bone and Potash	Baltimore
3258	" " "	Corn Guano	Baltimore
3136	" " "	High Grade Vegetable Compound.	Baltimore
3177	" " "	Truck Guano	Rockville
3158	Northwestern Fertilizer Co., Chicago, Ill.	Horseshoe Brand Ammoniated Dis Bone.	Laurel
3152	" " "	Horseshoe Brand Challenge Corn Grower.	Laurel
3157	" " "	Horseshoe Brand Fine Raw Bone.	Laurel
3153	" " "	Horseshoe Brand Potato Grower.	Laurel
3155	" " "	Horseshoe Brand Prairie Phosphate.	Laurel
3154	" " "	Horseshoe Brand Pure Ground Bone.	Laurel
3156	" " "	Horseshoe Brand Ralston's Bone Meal.	Laurel
3123	G. Ober & Sons Co., Baltimore, Md.	Dissolved Bone Phosphate.	Baltimore
3147	" " " "	Dissolved Bone Phosphate and Potash.	Baltimore
3176	" " " "	Farmers' Mixture	Gaithersburg
3125	" " " "	Farmers' Standard Ammoniated Phosphate.	Baltimore

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No.	NITROGEN Calculated as AMMONIA.		POTASH, K₂O.		PHOSPHOHIC ACID.					Comparative Value per Ton Found.	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	Found.	Guaranteed.	Insoluble Found.	Found.	Guaranteed.	Found.	Guaranteed.		
2707	1.24	1	1.03	1	3.44	8.91	7	12.35	11	$17.50	$14.80
2703	6.64	7	2.40	2	.86	6.41	5	7.27	6	30.53	29.60
2913	....	....	2.09	2	1.66	10.00	10	11.66	12	12.75	12.80
2698	....	....	...	....	2.03	13.48	13	15.51	14	13.48	13.00
3134	....	....	....	*1	21 45	1.90	... ...	23.35	21.60	10.48	8 64
3113	3.56	3½	4.66	5¼	2.55	8.81	8 50	11.36	....	27.44	25.95
3257	.80	½	3.07	3	2.09	9.77	8	11.86	9	18.44	14.70
3258	.85	1	2.70	3	1 77	9.78	7	11.55	8	18.05	15.00
3136	2.62	4	3.02	6	2.49	8.50	5	10.99	6	22.57	24.60
3177	2.17	2½	3.89	3	1.68	9.11	10	10.79	10	22.66	22.50
3158	3.20	2½	1.22	.54	3.21	8.41	8	11.62	12	23.08	20.04
3152	3.28	2½	1.05	.54	4.51	7.80	8	12.31	12	22.96	20 04
3157	5.01	4	....	....	......	....	....	22.25	22	29.70	......
3153	3.29	3	2.50	2	4.23	6.72	7	10.95	....	22.97	19.40
3155	2.99	2	.....	....	4.40	7.47	6	11.87	9	20.57	15 00
3154	4.64	3	....	....	......	......	......	23.33	18	30.70	......
3156	5.11	3	....	....	......	....	....	22.65	13	27.93	......
3123	....	....	....	....	1.04	15.88	14	16.92	16½	15.88	14.00
3147	....	....	2.09	2	1.24	13.79	10	15.03	12	16.38	12 80
3176	2.09	2	2.18	1½	2 59	9.57	8	12.16	11½	21.48	19.20
3125	2.58	2	2.35	1½	2.49	8.79	8	11.28	10½	22.13	18.60

*Guaranteed as Insoluble.

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
3106	G. Ober & Sons Co., Baltimore, Md.	Special Ammoniated Dissolved Bone.	Baltimore
3104	" " " "	Special Compound for Tobacco.	Baltimore
3110	" " " "	Special Potato and Vegetable Fertilizer.	Baltimore
3143	Patapsco Guano Co., Balmore, Md.	Ammoniated Corn Fertilizer.	Baltimore
3139	" " " "	Baltimore Soluble Phosphate.	Baltimore
3148	" " " "	Coon Brand	Baltimore
3249	" " " "	Dissolved Raw Bone	Cockeysville
3103	" " " "	Early Trucker	Baltimore
3247	" " " "	Grange Mixture	Cockeysville
3259	Wm. A. Pleasants, Baltimore, Md.	Bone and Peruvian Producer.	Baltimore
3115	" " "	High Grade Acid Phos., or Dis. S. C. Rock.	Baltimore
3246	" " "	Mixture No. 2 for Corn and Oats	Baltimore
3262	" " "	Pure Dissolved Bone	Baltimore
3268	" " "	Special Corn Fertilizer	Baltimore
3144	R. H. Pollock, Baltimore, Md.	Accomac Trucker	Baltimore
3209	" " "	Ammoniated Bone Phosphate.	Belair
3210	" " "	Dissolved Animal Bone	Belair
3141	" " "	Dissolved S. C. Bone	Baltimore
3212	" " "	Ground Animal Bone	Fallston
2767	" " "	Soft Ground Bone	Cambridge
2768	" " "	Special Potato and Tobacco.	Cambridge.

Maryland Agricultural College, March to July, 1896, Continued.

No.	NITROGEN Calculated as AMMONIA.		POTASH, K_2O.		PHOSPHORIC ACID.					**Comparative Value per Ton Found.**	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.	Insoluble Found.	**Found.**	Guaranteed.	**Found.**	Guaranteed.		
3106	**1.75**	1½	**2.27**	1½	.93	**11.24**	6	**12.17**	8¾	**$21.57**	$14.85
3104	**3.08**	2	**4.04**	2.30	1.80	**8.77**	8	**10.57**	10	**24.88**	19.10
3110	**3.23**	3	**4.63**	4	1.34	**10.62**	8	**11.96**	9½	**27.86**	23 50
3143	**1.59**	1¼	**2.12**	2	1.20	**9.53**	9	**10.73**	....	**19.05**	16.55
3139	....	....	**1.75**	1½	.50	**13.09**	10	**13.59**	12	**17.76**	15.04
3148	**1.16**	1	**3.33**	3	1.04	**8.91**	8	**9.95**	....	**18.12**	15.60
3249	**2.99**	2	....	......	4.96	**11.74**	12	**16.70**	13	**26.04**	21 00
3103	**4.62**	5	**5.31**	5	1.76	**8.13**	7	**9.89**	....	**30.00**	28.40
3247	**2.07**	2	**2.36**	1½	1.48	**10.02**	10	**11.50**	12½	**21.48**	21 00
3259	**4.60**	5	**8.07**	9	1.19	**9.81**	7	**11.00**	11	**34.34**	34.80
3115	....	......	....	....	1.52	**14.81**	14	**16.33**	15	**14.81**	14.00
3246	**2.00**	1	**3.09**	2	.63	**10.69**	10	**11.32**	....	**22.30**	17.00
3262	**2.22**	2	....	....	2.95	**9.66**	15	**12.61**	15	**20.02**	24.00
3268	**2.57**	3	**2.67**	3	1.36	**9.44**	6	**10.80**	10	**22.52**	21 60
3144	**5.02**	5	**5.37**	5	1.15	**8.22**	9	**9.37**	10	**30.98**	31.40
3209	**2.06**	2	**2.92**	2	1.88	**11.10**	10	**12 98**	11	**23.55**	20.60
3210	**2.94**	2½	.....	....	3 03	**13.29**	12	**16.32**	12	**26.59**	21.90
3141	.....	....	....	....	.90	**15.42**	14	**16.32**	16	**15.42**	14.00
3212	**5.05**	4	....	....	....	.....	....	**22.42**	22	**27.48**	.....
2767	**3.00**	3	....	....	5.99	**9.50**	14	**15.49**	14	**23.99**	25 80
2768	**2.61**	2½	**3.44**	3	1.34	**9.08**	10	**10.42**	11	**22.97**	23 10

Table of Analysis and Valuations of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
3140	R. H. Pollock, Baltimore, Md.	Special Potato and Tomato Fertilizer.	Baltimore
3264	" " "	Special Wheat Grower	Baltimore
3101	" " "	Superior Corn and Tomato Fertilizer.	Baltimore
3111	Powell Fertilizer & Chemical Co., Baltimore, Md.	Dissolved S. C. Bone	Baltimore
3117	" " "	Green Bag	Baltimore
3270	" " "	Potato Producer	Baltimore
3112	" " "	Red Bag	Baltimore
3251	" " "	Spring Crop Producer	Baltimore
3167	Ramsburg Fertilizer Co., Frederick, Md.	Corn and Potato Fertilizer	Mt. Airy
3178	" " "	Dissolved Animal Bone	Silver Springs
3181	" " "	Dissolved Bone Superphosphate.	Silver Springs
3166	" " "	Excelsior Plant Food	Mt. Airy
3169	" " "	Excelsior Plant Food—Tobacco.	Mt. Airy
3171	" " "	Old Virginia Compound	Frederick
3179	" " "	Pure Raw Bone	Silver Springs
3261	Rasin Fertilizer Co., Baltimore, Md.	Acid Phosphate	Baltimore
3145	" " " "	Bone and Potash	Baltimore
3263	" " " "	Empire Guano.	Baltimore
3260	" " " "	Truck Guano	Baltimore
3211	Henry Reckard Manufacturing Co., Belair, Md.	Animal Bone Phosphate	Fallston
3208	" " " "	Dissolved S. C. Bone	Belair

Maryland Agricultural College, March to July, 1896, Continued.

No.	NITROGEN Calculated as AMMONIA.		POTASH, K₂O.		PHOSPHORIC ACID.					Comparative Value per Ton Found.	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.	Insoluble Found.	**Found.**	Guaranteed.	**Found.**	Guaranteed.		
3140	**2.41**	2½	**2.62**	3	1 30	**9.28**	10	**10.58**	11	**$21.77**	$23.10
3264	**1.15**	1	**4.00**	2	1 23	**9.08**	9	**10.31**	10	**19.09**	16 40
3101	**1.32**	1	**3.54**	2	.97	**8.34**	9	**9.31**	10	**18.09**	16.40
3111	.....	....	.....	....	2 30	**13.76**	13	**16.06**	15	**13.76**	13.00
3117	**5.95**	6	**9.03**	8	2 83	**5.28**	5	**8.11**	....	**34.92**	32.00
3270	**1.23**	2	**2.34**	2	1.79	**8.56**	8	**10.35**	....	**17.37**	17.60
3112	**2.13**	2	**2.32**	2	2.94	**7.45**	8	**10.39**	....	**19.41**	17.60
3251	1.23	....	**2.36**	....	1.76	**7.44**	....	**9.20**	....	**16.04**	......
3167	**1.28**	1	**2.07**	2	4 02	**8.60**	8	**12.62**	9	**18.64**	15.20
3178	**3.13**	2	.....	....	4.50	**11.79**	10	**16.29**	13	**26.24**	19.80
3181	.....	....	.....	....	1.00	**14.46**	14	**15.46**	16	**14.46**	14.00
3166	**2.66**	2	**1.32**	1	3.46	**9.51**	9	**12.97**	11	**22.79**	19.00
3169	**2.43**	2	**1.85**	1	3.59	**9.25**	9	**12.84**	11	**22.39**	19.00
3171	**1.47**	1	**1.61**	2	3 06	**9.60**	8	**12.66**	10	**19.37**	15.80
3179	**3.78**	....	....	....	.....	.....	....	**25.00**	....	**30.61**	......
3261	.....	....	.....	....	.31	**15.93**	14	**16.24**	15	**15.93**	14.00
3145	.....	....	**1.14**	1¼	1.36	**12.07**	12	**13.43**	13.	**13.75**	13.90
3263	**2.84**	2.43	**2.06**	1½	2.84	**8.76**	8	**11.60**	10	**22.79**	19.59
3260	**3.34**	4	**2.71**	2	1.10	**10.04**	7	**11.14**	8	**25.44**	23.00
3211	**1.20**	1	**3.60**	1½	1.18	**8.72**	8	**9.90**	8	**18.37**	14.10
3208	.....	....	.....	....	.97	**14.43**	14	**15.40**	....	**14.43**	14.00

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2757	Henry Reckord Manufacturing Co., Bel Air, Md.	Fine Ground Bone	Baltimore
3150	" " "	Fine Ground Bone	Churchville
3127	" " "	Raw Bone	Baltimore
3128	" " "	Raw Bone	Baltimore
3100	" " "	Special Compound	Baltimore
3237	Rinehart & Clemson, Union Bridge, Md.	No. 2 Bone Phosphate	Union Bridge
3236	" " "	No. 3 Bone Phosphate	Union Bridge
3238	H. S. Roberts & Co., Westminster, Md.	Dissolved Animal Bone	Middleburg
3233	" " " "	Dissolved S. C. Bone	Westminster
3227	" " " "	Governor	Westminster
3226	" " " "	Leader	Westminster
3230	" " " "	Special Potato Manure	Westminster
3231	" " " "	Super	Westminster
3229	" " " "	Super "A"	Westminster
3232	" " " "	Vine and Vegetable	Westminster
3196	Scott Fertilizer Co., Elkton, Md.	Pure Dissolved Animal Bone.	Elkton
3182	" " " "	Pure Ground Bone	Aberdeen
3199	" " " "	Potato Fertilizer No. 2	Rising Sun
3192	" " " "	Standard Phosphate	Elkton
3194	" " " "	Sure Growth Compound	Elkton
3191	" " " "	Sure Growth Superphosphate.	Elkton

Maryland Agricultural College, March to July, 1896, Continued.

No.	NITROGEN Calculated as AMMONIA.		POTASH, K$_2$O.		PHOSPHORIC ACID.					Comparative Value per Ton Found.	Comparative Value per Ton Guaranteed.
					Insoluble Found.	Available.		Total.			
	Found.	Guaranteed.	Found.	Guaranteed.		Found.	Guaranteed.	Found.	Guaranteed.		
2757	4.17	3	....	....	....	....	....	24.64	25	$29.51	......
3150	3.51	3	....	....	....	....	....	23.43	25	28.20	.....
3127	5.10	3	....	....	....	....	....	19.41	20	23.71	......
3128	5.37	5.29	....	....	....	....	....	19.93	20.38	24.04	......
3100	2.05	2.03	2.53	2.13	1.30	9.42	10.66	10.72	13.18	20.76	22.52
3237	2.12	1.55	1.98	2½	1.67	8.48	8.27	10.15	9	19.52	17.67
3236	1.83	¾	2.69	3.21	1.29	7.52	8.09	8.81	8½	17.97	15.17
3238	2.14	2	....	....	1.23	13.62	12	14.85	13	23.50	20.40
3233	...	...	....	....	1.42	10.98	13	12.40	15	10.98	13.00
3227	1.07	1½	2.78	2½	2.89	9.49	8	12.38	9	19.11	17.20
3226	.86	1	1.58	1½	3.61	8.05	8	11.66	....	15.99	14.10
3230	2.50	2½	4.87	6	2.76	8.22	8	10.98	9	22.99	23.70
3231	....	....	.25	¾	5.31	8.92	11	14.23	13	11.29	12.55
3229	.78	¾	1.53	1	2.67	7.91	7½	10.58	8½	14.96	12.85
3232	4.98	6	6.91	8	1.96	8.59	8	10.55	....	33.34	35,60
3196	2.50	2½	....	....	2.36	10.38	13	12.74	....	21.38	23.10
3182	4.90	4	....	....	....	....	....	22.40	22	28.60	......
3199	2.74	2	6.07	4	2.79	6.57	8	9.36	....	23.84	19.60
3192	1.76	1½	2.81	2	2.03	9.67	8	11.70	....	20.91	16.10
3194	3.99	4½	6.27	7	2.70	8.62	8	11.32	....	30.20	30.10
3191	2.72	2	2.64	2	2.30	9.08	9	11.38	....	23.08	18.80

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
3190	Scott Fertilizer Co., Elkton, Md.	Tip Top Soluble Bone......	Elkton..........................
3195	" " " "	Tip Top Soluble Bone and Potash.	Elkton..........................
3183	Sharpless & Carpenter, Philadelphia, Pa.	Pure Bone Meal..................	Aberdeen.........................
3126	G. W. Sharrett & Co., Baltimore, Md.	Fish, Rock and Potash....	Baltimore....................
3223	J. D. Simmons, Hagerstown, Md.	Excelsior Fruit Producer	Hagerstown................
3222	" " "	Wheat and Clover Fertilizer.	Hagerstown..............
3132	Slingluff & Co., Baltimore, Md.	Agency's Favorite............	Baltimore....................
3165	" " "	Ammoniated Bone............	Woodstock ....
3240	" " "	Baltimore Dissolved Bone	New Windsor............
2765	" " "	Canners' Compound..........	Baltimore ....
3121	" " "	Corn and Oats..................	Baltimore.....................
3149	" " "	Dissolved S. C. Bone.......	Baltimore....................
3120	" " "	McAfee's Potato Grower.	Baltimore....................
3269	" " "	Native Superphosphate....	Baltimore ....
3266	" " "	Potato Grower....................	Baltimore....................
3214	" " "	Raw Bone Dissolved..........	Williamsport.............
3163	" " "	Special Bone Phosphate....	Sykesville ....
3116	" " "	Tobacco Bed Fertilizer....	Baltimore....................
3254	" " "	Top Dresser.........................	Baltimore ....
3265	" " "	Truckers' Favorite...........	Baltimore ....
3216	" " "	Universal Guano................	Hancock......... ....

Maryland Agricultural College, March to July, 1896, Continued.

No.	NITROGEN Calculated as AMMONIA.		POTASH, K_2O.		PHOSPHORIC ACID.					Comparative Value per Ton Found.	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.	Insoluble Found.	**Found.**	Guaranteed.	**Found.**	Guaranteed.		
3190	....	....	....	....	2 01	14.11	14	16.12	....	$14.11	$14.00
3195	...	....	2.06	2	2.82	12.64	11	15.46	....	15.83	13.00
3183	4.99	3.	....	....	....	.....	....	23.21	19	31.09	.....
3126	.49	¼	.85	½	1.05	5.03	5	6.08	6	8.99	7.85
3223	1.27	1	5.23	6	.54	7.33	6	7.87	....	18.04	16.20
3222	2.19	2	6.74	6	4.06	10.47	14	14.53	......	28.31	28.80
3132	2.78	....	2.88	....	1.91	11.18	......	13.09	....	25.79	.....
3165	2.81	2½	3.18	2½	2.15	10.00	9	12.15	....	24.90	20.80
3240	1.24	1	1.42	1	1.00	11.86	10	12.86	....	19.97	16.00
2765	2.14	2	2.67	2½	1.57	11.19	9	12.76	....	23.46	19.30
3121	....	....	2.62	2½	.38	13.21	13	13.59	....	15.98	15 50
3149	....	....	....	....	.45	14.33	14	14.78	....	14.33	14.00
3120	1.67	2	4.66	5	1.14	11.02	11	12.16	....	23.57	24.20
3269	2.69	... .	.91	....	1.60	19.25	....	20.85	....	33.04	.....
3266	4.00	4	4.72	4½	.96	7.89	7	8.85	....	26.77	24.65
3214	2.80	2½	....	....	3.07	11.66	8	14.73	10	24.23	18.30
3163	1.01	1	....	....	.54	13.15	12	13.69	13	19.13	18.00
3110	10.35	10	2.82	2½	1.01	6.24	4	7.25	....	41.97	37.30
3254	5.70	5	2.53	2½	1.70	2.09	.. ....	3.79	5	23.16	20 50
3265	3.75	3¾	3.91	3	1.06	11.73	9	12.79	....	29.88	25.05
3216	1.17	1	2.26	2	1.92	9.82	9	11.74	....	18.70	15.80

Table of Analysis and Valuation of Fertilizers Made at the

No	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
3224	Geo. W. Stocksdale, Thurmont, Md.	Ammoniated Superphosphate.	Thurmont
3225	" " "	Dissolved Animal Bone Phosphate.	Thurmont
3220	J. W. Stonebraker & Son, Hagerstown, Md.	Champion	Hagerstown
3239	Jos. A. Stoffer, New Windsor, Md.	Sol. Wheat Grower	New Windsor
3174	Susquehanna Fert. Co., Baltimore, Md.	Alkaline Bone Phosphate.	Woodsboro
3205	" " "	Ammoniated Bone Phosphate.	Prospect
3204	" " "	Pure Dissolved Bone	Prospect
3250	" " "	Pure Ground Bone	Baltimore
3202	" " "	Pure Bone Phosphate	Prospect
3217	" " "	S. C. Bone	Keedysville
3168	" " "	Superior Rock Phosphate	Mt. Airy
3159	Talbott & Clark, Elicott City, Md.	Ammoniated Bone Phosphate.	Ellicott City
3160	" " " "	Special Potato Manure	Ellicott City
3102	H. S. Taveau & Co., Baltimore, Md.	Special Compound No. 1	.Baltimore
3221	D. A. Thomas, Hagerstown, Md.	Thomas' Bone Mixture	Hagerstown
3130	I. P. Thomas & Sons Co., Philadelphia, Pa.	Normal Bone Phosphate.	Baltimore
3131	" " " "	Potato Manure	Baltimore
3129	" " " "	Tip Top Raw Bone Superphosphate.	Baltimore
3218	Thompson & Edwards Fertilizer Co., Chicago, Ill.	Blood and Bone Animal Guano.	Keedysville
3219	" " "	Pure Fine Ground Bone	Keedysville
3253	Wm. B: Tilghman & Co., Salisbury, Md.	Dissolved Tankage	Baltimore

Maryland Agricultural College, March to July, 1896, Continued.

No.	NITROGEN Calculated as AMMONIA.		POTASH, K_2O.		PHOSPHORIC ACID.					**Comparative Value per Ton Found.**	Comparative Value per Ton Guaranteed.
					Insoluble Found.	Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.		**Found.**	Guaranteed.	**Found.**	Guaranteed.		
3224	.59	¾	1.28	2¼	1 76	9.96	8	11.72	....	$16.06	$14.10
3225	1.13	1	1.52	2¼	1.97	8.84	8	10.81	....	16.70	14.85
3220	2.08	2	4.47	4	1 49	9.92	9	11.41	....	23.50	20 80
3239	.....	....	3.55	3	1.10	11.20	7½	12.30	9½	15.19	11.30
3174	.....	....	2.05	2	1 38	12.03	10	13.41	12	14.63	12.80
3205	1.50	1½	2.14	1½	2.45	12.06	9	14.51	11	22.58	18.00
3204	2.51	2	.....	....	6.65	10.65	10	17.30	....	24.30	18.00
3250	4.50	4	.....	....	. .	...	....	22.06	20	25.21	......
3202	2.32	2	2.62	1½	6.93	10.39	9	17.32	11	26.21	19.50
3217	.....	....	.....	.....	1.53	14.69	14	16.22	....	14.69	14.00
3168	.....	....	.....	....	1.64	14.66	14	16.30	15	14.66	14.00
3159	2.00	2	3.17	2	2.14	9.46	9	11.60	14	22.43	21.80
3160	2.72	3	4.59	5	1.95	9.80	9	11.75	10	25.68	25.40
3102	4.56	5	5.72	5	1.25	7.74	9	9.04	....	29.42	30.80
3221	1.82	1½	3.73	2½	1.14	9.20	9	10.34	....	20.91	17.80
3130	2.01	1¼	2.27	1½	1.19	8.81	8½	10.00	9½	19.58	16.05
3131	4.00	3	6.65	6	.88	8.21	9	9.09	10	29.03	26.40
3129	3.99	3	2.77	2¾	.63	11.34	10	11.97	13	28.73	25.55
3218	6.19	6½	.....	......	8 16	8.17	10	16.33	10	33.28	31 50
3219	2.50	3	.....	....	.....	.....	....	19.30	22	23.34	......
3253	2.88	3	.....	......	2 07	10.11	10	12.18	....	22.01	21 00

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
2787	Wm. B. Tilghman & Co., Salisbury, Md.	Tilghman's Fish Mixture.	Salisbury
2789	" " " "	Fish Mixture No. 2.	Salisbury
2790	" " " "	Irish Potato Manure	Salisbury
2788	" " " "	Mixture B.	Salisbury
3109	Walter Todd, Baltimore, Md.	Dissolved S. C. Rock	Baltimore
3146	" " "	Rock and Potash	Baltimore
2800	" " "	Rock and Potash.	Denton.
3108	" " "	No 1 Standard Truck Fertilizer.	Baltimore
2791	E. S. Truitt, Salisbury, Md.	Truitt's Fish Mixture XX	Salisbury
2780	Tygert-Allen Fertilizer Co. Philadelphia, Pa.	Ammoniated Bone Phosphate.	Pocomoke.
2781	" " " "	Clogg's Soluble Bone and Potash.	Pocomoke
2779	" " " "	Gold Edge Potato Guano	Pocomoke
2778	" " " "	High Grade S. C. Bone	Pocomoke
2783	" " " "	6% Guano	Pocomoke
2782	" " " "	Standard Bone Phosphate	Pocomoke
3188	" " " "	Star Bone Phosphate	Elkton
2784	" " " "	Star Pure Ground Bone	Pocomoke
3186	J. E. Tygert & Co., Philadelphia, Pa.	Ammoniated Superphosphate.	Leslie
3187	" " " "	Bone Phosphate	Leslie
3185	" " " "	Popular Phosphate	Leslie
3172	J. Tyson & Son, Frederick, Md.	Ammoniated Superphosphate of Lime.	Frederick

Maryland Agricultural College, March to July, 1896, Continued.

No.	NITROGEN Calculated as AMMONIA.		POTASH, K$_2$O.		PHOSPHORIC ACID.					Comparative Value per Ton Found.	Comparative Value per Ton Guaranteed.
					Insoluble Found.	Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.		**Found.**	Guaranteed.	**Found.**	Guaranteed.		
2787	3.99	3	1.21	1	2.71	7.16	6	9.87	....	23.40	17.20
2789	2.99	2	1.41	1	2.42	8.38	7	10.80	....	21.89	15.40
2790	6.10	5	4.70	4	1.61	7.83	6	9.44	....	33.37	26 20
2788	4.07	3	2.36	2	1 79	8.92	8	10.71	....	26.34	20.60
3109	....	....	.....	....	1.64	14.20	14	15.84	16.00	14.20	14.00
3146	.....	....	2.03	2	.80	12.32	10	13.12	11	14.67	12.40
2800	.....	....	2.03	2	.83	12.73	10	13.66	11	15.09	12.40
3108	1.28	1½	2.43	1½	1.46	9.19	9	10.65	10	18.18	17.40
2791	3.03	2½	1.84	1.48	1.93	8.23	5.32	10.16	8.83	21.97	17.47
2780	1.51	1¼	1.51	1	.59	8.97	8	9.56	....	17.15	14.35
2781	....	....	1.84	1	1.55	10.07	10	11.62	....	12.53	11.00
2779	3.07	3	5.69	5	1 47	9.24	6	10.71	....	26.87	21 20
2778	....	....	.....	....	.97	14.08	14	15.05	15.	14.08	14.00
2783	6.48	6	5.09	5	.86	9.19	6	10.05	.... ..	36.08	30.20
2782	2.25	2	2.38	2	1.04	8.95	8	9.99	....	20.49	17.60
3188	2.50	2½	2.90	2½	2.62	9.37	8½	11.99	10½	23.21	21.40
2784	4.44	4	.....	....	.....	.....	....	21.29	21	26.98	.....
3186	1.35	1½	1.88	1½	.95	8.55	8	9.50	9½	16.76	16.50
3187	2.43	2¼	3.47	2½	1.11	9.08	9	10.19	11	22.33	21.25
3185	1.67	1	1.62	1¼	.83	9.76	7	10.59	8	18.84	13.25
3172	1.20	2	2.74	1	1.90	10.30	7	12.20	....	19.84	15.40

Table of Analysis and Valuation of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
3173	J. Tyson & Son, Frederick, Md.	Dissolved S. C. Bone........	Frederick..................
3162	W. H. D. Warfield, Sykesville, Md.	Potato Compound............	Sykesville..................
2772	S. L. Webster & Son, Cambridge, Md.	No. 2 Ammoniated Bone Phosphate.	Cambridge................
2770	“ “ “ “	Our Special 6% Guano......	Cambridge................
2771	“ “ “ “	Pondrette Mixture............	Cambridge................
2773	“ “ “ “	The Times Bone Phosphate	Cambridge................
3189	M. E. Wheeler & Co., Rutland, Vt.	Royal Wheat Grower........	Elkton......................
2677	Williams & Clark, New York, N. Y.	AmericusBrand Bone and Potash.	Ridgely.....................
2793	“ “ “ “	Acorn Brand Acid Phosphate.	Ridgely.....................
2794	“ “ “ “	Pure Bone Meal.................	Ridgely.....................
2792	“ “ “ “	Royal Bone Phosphate......	Ridgely.....................
2795	“ “ “ “	Tankage.............................	Ridgely.....................
2676	F. M. Wilson, Pocomoke City, Md.	Favorite............................	Pocomoke ....
2775	“ “ “	Favorite Truck Fertilizer	Pocomoke ....
2674	“ “ “	Peninsula Fertilizer..........	Pocomoke ....
2776	“ “ “	Peninsula Ammoniated Superphosphate.	Pocomoke. ....
2675	“ “ “	Worcester Guano...............	Pocomoke ....
2777	“ “ “	Worcester Guano...............	Pocomoke ....
3119	Wooldridge Fertilizer Co., Baltimore, Md.	Bone and Potash Mixture	Baltimore ....
3107	“ “ “	Kangaroo Komplete Kompound.	Baltimore..................
3118	“ “ “	Little Giant.......................	Baltimore..................

Maryland Agricultural College, March to July, 1896, Continued.

No.	NITROGEN Calculated as AMMONIA.		POTASH, K_2O.		PHOSPHORIC ACID.					**Comparative Value per Ton Found.**	Comparative Value per Ton Guaranteed.
					Insoluble Found.	Available.		Total.			
	Found.	Guaranteed.	**Found.**	Guaranteed.		**Found.**	Guaranteed.	**Found.**	Guaranteed.		
3173	.....	....	.....	....	1.64	**14.72**	14	**16.36**	....	**14.72**	14.00
3162	**1.43**	1½	**2.19**	2.16	.95	**10.29**	9	**11.24**	....	**19.40**	17.46
2772	**2.32**	2½	**2.58**	2	1.25	**7.74**	7.48	**8.99**	8.53	**19.58**	19.71
2770	**6.28**	6	**4.91**	5	1.29	**5.22**	7	**6.51**	....	**30.78**	31.40
2771	**.85**	.51	**2.97**	3.01	1.32	**6.08**	6½	**7.40**	7 62	**13.61**	13 01
2773	**.70**	½	**2.70**	2½	.95	**9.27**	9	**10.22**	9.65	**16.49**	15.19
3189	**1.01**	1	**2.08**	2	1.13	**8.75**	8	**9.88**	9	**16.29**	15.20
2677	.....	....	**2.48**	2	2 48	**10.86**	10	**13.34**	....	**14.34**	12.00
2793	.....	....	.....	....	1.37	**14.32**	13	**15.69**	14	**14.32**	13 00
2794	**3.33**	3	.....	....	.....	.....	....	**21.36**	20	**25.20**	....
2792	**1.60**	1½	**2.50**	2	3.06	**8.36**	7	**11.42**	8	**19.17**	14.75
2795	**8.48**	8	.....	....	.....	.....	....	**10.79**	....	**26.82**	24.00
2676	**3.00**	3	**4.29**	4	2 26	**9.19**	7	**11.45**	....	**25.68**	21.40
2775	**3.03**	2	**4.50**	4	1 86	**8.97**	7	**10.83**	....	**25.47**	21.40
2674	**1.49**	1	**1.80**	1½	1.99	**11.57**	10	**13.56**	....	**21.34**	16 50
2776	**1.41**	1	**1.98**	1½	1.37	**11.09**	10	**12.46**	....	**20.34**	16 50
2675	**2.97**	2	**2.98**	2	2.11	**9.48**	8	**11.59**	....	**24.54**	17.60
2777	**2.77**	2	**3.26**	2	2.45	**8.99**	8	**11.44**	....	**23.83**	17.60
3119	.....	....	**2.84**	2.28	**2.91**	**11.12**	8	**14.03**	11	**15.12**	11.48
3107	**2.27**	2	**3.13**	4	2.85	**9.36**	8	**12.21**	....	**22.88**	19 60
3118	**1.12**	1	**2.59**	2	.99	**9.46**	9	**10.45**	9	**17.89**	15 80

Table of Analysis and Valuations of Fertilizers Made at the

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Place of Sampling.
3215	Wooldridge Fertilizer Co., Baltimore, Md.	Orchilla Guano	Cumberland
2916	" " "	Silver Gray A. A. Phosphate.	Baltimore
3200	" " "	Sockless and Shoeless	Conowingo
3114	" " "	Special Potato Fertilizer.	Baltimore
3201	" " "	XXTRA Acid Phosphate	Conowingo
3122	The Robt. A. Wooldridge Baltimore, Md.	Sweep-stakes Truck Phosphate.	Baltimore
3124	" " "	Triumph Bone Phosphate	Baltimore
3252	Zell Guano Co., Baltimore Md.	Ammoniated Bone Super phosphate.	Baltimore
3142	" " " "	Calvert Guano	Baltimore
3267	" " " "	Dissolved Bone Phosphate and Potash.	Baltimore
3241	" " " "	Special Compound.	Glen Morris
3105	" " " "	Special Compound for Potatoes.	Baltimore

Maryland Agricultural College, March to July, 1896, Continued.

No.	NITROGEN Calculated as AMMONIA.		POTASH, K₂O.		PHOSPHOHIC ACID.					Comparative Value per Ton Found.	Comparative Value per Ton Guaranteed.
						Available.		Total.			
	Found.	Guaranteed.	Found.	Guaranteed.	Insoluble Found.	Found.	Guaranteed.	Found.	Guaranteed.		
3215	....	....	....	....	7.24	5.00	......	12,24	14	7.90	7.00
2916	1.65	2	1.43	1	4.28	8.04	8	12.32	10	18.60	17 80
3200	1.47	1¼	1.82	1¼	2.80	9.72	8	12.52	....	19.57	14.60
3114	2.06	....	4.78	....	3 45	9.51	....	12.96	....	24.44	.....
3201	...	....	...	....	.69	15.40	14	16.09	14	15.40	14.00
3122	2.66	3	8.80	8	.46	7.26	7	7.72	7	25.67	24.40
3124	1.67	1½	3.42	3	1.33	9.17	9	10.50	9	20.23	17 30
3252	2.14	2	2.06	2	1.92	10.52	8	12.44	10	22.25	18.80
3142	1.07	¾	1.80	1½	1.24	11.74	9	12.98	11	19.84	15.75
3267	....	....	1.11	1	1.21	13.56	12	14.77	14	15.15	13.80
3241	3.18	3	4.49	4	1.49	9.84	8	11.33	10	26.73	23 80
3105	3.29	3½	4.24	4	1.35	9.88	8	11.23	10	26.78	23 80

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Table Showing Mechanical Annalysis of Ground Bone.

(The Chemical Analysis is Given in Preceding Table.)

No.	Name and Address of Manufacturer.	Name of Fertilizer.	Fine, Less than 1-50 inch.	Fine-Medium, 1-25 to 1-50 inch.	Medium, 1-12 to 1-25 inch.	Coarse, Larger than 1-12 inch.
2680	Baugh & Sons Co., Baltimore, Md.	Bone Meal....	31	36	33	0
2911	John Bullock & Son, Baltimore, Md.	Pure Ground Raw Bone........	24	26	24	26
2859	Josiah Cope & Co., Lincoln University, Pa.	Pure Steamed Bone............	46	34	20	0
2868	Chemical Company of Canton. Baltimore, Md.	Baker's Standard Bone.........	49	31	20	0
2846	E. A. Clendennin & Bro., Colora, Md.	Pure Raw Bone.................	23	21	25	31
2832	Detrick Fertilizer and Chemical Co., Baltimore, Md.	Pure Fine Ground Animal Bone.	25	31	27	17
2835	Eureka Fertilizer Co., Perryville, Md.	Fine Ground Bone.......	23	34	42	0
2747	W. S. Farmer & Co., Baltimore, Md.	Pure Bone Meal..........	28	34	26	12
2684	Griffith. Turner & Co, Baltimore, Md.	Ground Bone....................	12	25	38	25
2705	J. Horner, Jr. & Co, Baltimore. Md.	Slaughter-House Bone Dust..	17	31	21	31
2738	Hubbard & Co, Baltimore, Md.	Western Ground Bone..........	3	19	26	52
2811	M. P. Hubbard & Co., Baltimore. Md.	Genuine Pure Raw Bone......	28	22	27	23
2876	C. M. Keedy, Keedysville, Md.	Bone Meal...	49	33	16	0
2754	Miller Fertilizer Co., Baltimore. Md.	Ground Bone.......	22	56	22	0
2929	" " " "	Pure Bone Meal..................	39	31	30	0
3157	North-Western Fertilizer Co.. Chicago. Ill.	Horse Shoe Brand Fine Raw Bone.	34	30	36	0
3154	" " " "	Horse Shoe Brand Fine Raw Bone.	37	40	23	0
3156	" " " "	Horse Shoe Brand Ralston Bone Meal.	26	27	31	16
3212	R. H. Pollock, Baltimore. Md.	Ground Animal Bone.....	26	28	25	21
3179	Ramsburg Fertilizer Co., Frederick, Md.	Pure Raw Bone................	54	22	17	7
2757	Henry Reckord Manufacturing Co., Bel Air. Md.	Fine Ground Bone...............	30	44	19	7
3150	" " "	Fine Ground Bone...............	46	33	13	8
3127	" " "	Baw Bone.......	12	32	33	23
3128	" " "	Raw Bone........................	11	25	39	25
3183	Sharpless & Carpenter, Philadelphia, Pa.	Pure Bone Meal.	32	44	24	0
3182	Scott Fertilizer Co., Elkton, Md	Pure Ground Bone............	32	29	29	10
3250	Susquehanna Fertilizer Co.. Baltimore. Md.	Pure Ground Bone.......... .	24	26	24	26
3219	Thomas & Edwards Fertilizer Co., Chicago, Ill.	Pure Fine Ground Bone... ...	59	25	10	6
2784	Tygert-Allen ertilizer Co. Philadelphia, Pa.	★ Star Pure Ground Bone.....	39	19	33	9
2794	Williams & Clark, New York. N. Y.	Pure Bone Meal.....	56	30	34	0

LIST OF FERTILIZERS LICENSED FOR SALE IN MARYLAND FOR THE THE YEAR ENDING JANUARY 31ST, 1897.

ALEXANDRIA FERTILIZER AND CHEMICAL COMPANY, ALEXANDRIA, VA.
- Dissolved S. C. Bone.

A. ANDERSON & CO., MT. AIRY, MD.
- Harvest Queen Guano.

BALTIMORE SEED AND IMPLEMENT CO., BALTIMORE, MD.
- Special Potato Fertilizer.
- Our Soluble Bone Phosphate.
- Standard Bone Phosphate.

BAUGH & SONS CO., BALTIMORE, MD.
- Animal Bone and Potash Compound.
- Corn Fertilizer.
- Double Eagle Phosphate.
- Export Bone, with Potash.
- Fish Mixture.
- General Crop Grower.
- High Grade Acid Phos. or Dis. S. C. Rock.
- High Grade Potato Guano.
- High Grade Tobacco and Truck.
- New Process 10 Per Cent. Guano.
- Potato Fertilizer.
- Pure Raw Bone Meal.
- Raw Bone Super. Phos. or Ammoniated Dis. An. Bone.
- Pure Dissolved Animal Bone.
- Soluble Alkaline Superphosphate.
- Special Potato Manure.
- Strawberry Mixture.
- Wheat Fertilizer.

BECK, WALKER & BROWN, CHESTERTOWN, MD.
- Corn Phosphate.
- Propagator.
- Tomato Phosphate.
- Trustworthy.
- Try Me.

WILLIAM BENDERS, MILLER'S, MD.
- Willliam Bender Fertilizer.

BERG CO., PHILADELPHIA, PA.
- Our Electric Special $25.00 Bone Manure.
- Electric Raw Bone, Fine.

JAMES BONDAY, JR., BALTIMORE, MD.
Old Reliable Brand Genuine German Kainit.

BRUMFIELD & FOSTER, COLORA, MD.
Ammoniated Bone Phosphate.

JOHN BULLOCK & SON, BALTIMORE, MD.
Dissolved Pure Raw Bone.
Pure Raw Bone.

JOSIAH COPE & CO., LINCOLN UNIVERSITY, PA.
Acid Rock.
Potato and Tobacco Phosphate.
Pure Steamed Bone.
Try Me Bone Phosphate.

HENRY COPE & CO., WEST GROVE, PA.
Ammoniated Bone Phosphate.

CROCKER'S FERTILIZER AND CHEMICAL CO., BUFFALO, N. Y.
Ammoniated Wheat and Corn Superphosphate.
Animal Bone and Potash.
Niagara Phosphate.
General Crop Phosphate.
New Rival Ammoniated Superphosphate.
Potato, Hop and Tobacco Phosphate.
Practical Ammoniated Superphosphate.

WILLIAM DAVISON & CO., BALTIMORE, MD.
Ammoniated Superphosphate.
Boss Ammoniated Superphosphate.
Penn-Mar.

RUFUS K. DAY, BROWNINGSVILLE, MD.
Day's Ammoniated Bone Phosphate.

LOUIS F. DETRICK, (SUCCESSOR TO WOOLDRIDGE COMPANY), BALTIMORE, MD.
Honest Dollar Ammoniated Bone Phosphate.
Kangaroo Komplete Kompound.
Monarch Ammoniated Superphosphate.
Orchilla Guano.
Silver Gray A. A. Phosphate.
Quick Step Bone Phosphate.
Sockless and Shoeless A. A. Bone Phosphate.
Wooldridge's Bone and Potash Mixture.
" Gold Basis Animal Bone Phosphate.
" IXCD. Animal Bone Phosphate.
" Pure Dissolved Animal Bone.
" Special Potato Fertilizer.
" XXTRA Acid Phosphate.

L. E. P. DENNIS & SON, CRISFIELD, MD.
Fish and Potash Mixture, No. 1.
Fish and Potash Mixture, No. 2.
Truck and Tomato Mixture.

DETRICK FERTILIZER AND CHEMICAL CO., BALTIMORE, MD.
Ammoniated Bone Phosphate.
Corn Fertilizer.
Dissolved Bone.
Dissolved S. C. Bone.
Excelsior Compound.
Farmers' New Method Phosphate.
Imperial Compound.
Mason's No. 4.
P. and B. Special Fertilizer.
Potato Fertilizer.
Pure, Fine Ground Bone.
Soluble Bone Phosphate and Potash.
Special Mixture.
Tobacco Plant Bed Fertilizer.
T. Sea Fowl Guano.
Vegetator Ammoniated Superphosphate.
Wheat Fertilizer.
Farmers and Planters' Agency Orient Guano.
Farmers and Planters' Agency Ammoniated Bone.
Farmers and Planters' Agency Chandos Guano.

JOSHUA DORSEY, ELLICOTT CITY, MD.
Ammoniated Phosphate.
Stag Potato Phosphate.

P. P. DUNAN, BALTIMORE, MD.
Bone and Potash.
Corn and Oats.
Dissolved Bone.
Good Luck.
Potato and Tomato.

D. ENGLAR, JR., MEDFORD, MD.
No. 1 Bone Phosphate.
No. 2 Bone Phosphate.

ENGLAR & RINEHART, LINWOOD, MD.
No. 1 Ammoniated Bone Phosphate.
No. 2 Ammoniated Bone Phosphate.

EUREKA FERTILIZER CO., PERRYVILLE, MD.
Corn and Potato Special.
Alkaline Bone and Potash.
Farmers' Favorite Bone Phosphate.
P. & P. Superphosphate.

WASHINGTON EWING, LANDENBURG, PA.
- Eclipse Raw Bone Phosphate.
- Pure Raw Bone.

FARMERS' FERTILIZER CO., WESTMINSTER, MD.
- No. 1 Bone Phosphate.
- No. 2 Bone Phosphate.
- No. 3 Bone Phosphate.
- XX. Bone Phosphate.

W. S. FARMER & CO., BALTIMORE, MD.
- B. & P. Fertilizer.
- Bone Meal.
- Clyde Brand.
- Dissolved Raw Bone.
- Harvest Queen.
- No. 1 Potato Manure.
- Potato Compound.
- Standard Phosphate.

N. I. GORSUCH & SONS, WESTMINSTER, MD.
- Dissolved Raw Bone Phosphate.
- Westminster No. 3 Bone Phosphate.

G. W. GRAFFLIN & SONS, BALTIMORE, MD.
- Early Trucker.

GRIFFFITH & BOYD, BALTIMORE, MD.
- Ammoniated Bone Phosphate.
- Ammoniated Soluble Bone.
- Bone Meal.
- Cereal Bone and Plant Food.
- High Grade Acid Phosphate.
- Peerless Fertilizer.
- Pure Dissolved Bone.
- Soft Ground Bone.
- Spring Crop Grower.
- Valley Fertilizer.

GRIFFITH, TURNER & CO., BALTIMORE, MD.
- Ammoniated Alkaline Plant Food.
- Ammoniated Butchers' Bone Phosphate.
- Animal Bone Phosphate.
- Dissolved Bone.
- Ground Bone.
- High Grade Acid Phosphate.
- Soft Ground Bone.
- Soluble Bone Phosphate.

WM. R. GRIFFITH, BALTIMORE, MD.
- Hard Times (G) Fertilizer.

Slaughter House (G) Phosphate.
The Trucker (G) Phosphate.
Try It (G) Phosphate.

HANOVER BONE FERTILIZER CO., HANOVER, PA.

Blood and Bone Compound.
Bone Meal.
Excelsior Compound.
Farmers' Crop Winner.
S. C. Rock.

S. M. HESS & BRO., READING, PA.

Ammoniated Bone Superphosphate.
Ground Bone.
Keystone Bone Phosphate.
Potato and Truck Manure.
Soluble Bone and Potash.

J. HORNER, JR., & CO., BALTIMORE, MD.

Ammoniated Raw Bone Superphosphate.
Cultivator.
Dissolved Slaughter House Bone Dust.
Slaughter House Bone Dust.

HUBBARD & CO., BALTIMORE, MD.

Columbia Gem Phosphate.
Farmers' I. X. L Phosphate.
High Grade Soluble S. C. Phosphate.
Oriental Phosphate.
Soluble Bone and Potash.
Standard Bone Superphosphate.
Wheat Growers' Jewel.

RANDOLPH HUMPHREYS, SALISBURY, MD.

Our Mixture, B.
Our Mixture, F.

S. L. LAMBERD & CO., BALTIMORE, MD.

Boss.
Special Potato Grower.

LAZARETTO GUANO CO., BALTIMORE, MD.

Alkaline Phosphate.
Ammoniated Bone Phosphate.
Bone Compound.
Crop Grower.
Excelsior Fruit Producer.
Forsythe & Linthicum's Mixture.
Holmes' High Grade Truck Guano.
Pure Dissolved S. C. Bone.
Special Tobacco and Potato.

LISTER AGRICULTURAL CHEMICAL WORKS, NEWARK, N. J.

- Celebrated Ground Bone.
- Harvest Queen.
- Standard.

J. H. LONGFELLOW, BALTIMORE, MD.

- Farmers' Delight, No. 1.
- Farmers' Delight, No. 2.

MAPES FORMULA AND PERUVIAN GUANO COMPANY, NEW YORK, N. Y.

- Cereal Brand.
- Complete Manure "A" Brand.
- Complete Manure for General Use.
- Complete Manure for Light Soils.
- Potato Manure.
- Corn Manure.

MARYLAND FERTILIZING CO., BALTIMORE, MD.

- Alkaline Bone.
- Ammoniated Bone.
- Bone Superphosphate.
- Dissolved Animal Bone.
- Dissolved Phosphate.
- Dissolved S. C. Bone.
- Fine Ground Animal Bone.
- Globe Complete Manure.
- Linden Superphosphate.
- O. K. Ammoniated Fertilizer.
- Potato Food.
- Langston's Cereal Plant Food.

MARYLAND GRANGE AGENCY, BALTIMORE, MD.

- Agency's Favorite.
- Corn and Potato Fertilizer.
- Dissolved S. C. Rock.

FOSTER MAYNARD, BALTIMORE, MD.

- Maynard's Choice.
- Trucker's Pride.

MILLER FERTILIZER CO., BALTIMORE, MD.

- Clinch.
- Dissolved Raw Bone.
- Ground Bone.
- Harvest Queen.
- Hustler.
- Potato Fertilizer.
- Standard.
- Tomato Fertilizer.

MONUMENTAL CHEMICAL CO., BALTIMORE, MD.

Acid Phosphate.
Arundel Complete.
Potato Manure.
Soluble Bone Phosphate and Potash.

MOUNT AIRY. MFG. CO., BALTIMORE, MD.

Garden and Truck Fertilizer.
Insula Guano for Corn and Oats.
Wm. H. Moore's Special for Tobacco Beds.
Piedmont Dis. Bone Phosphate and Potash Goods.
Piedmont Guano for Tobacco.
Piedmont Potato Producer.
Piedmont Pure Raw Bone Mixture.
S. C. Bone.

F. MEHRING, BRUCEVILLE, MD.

Acid Phosphate.
Ammoniated Superphosphate, No. 2.
Baumgardner's Mixture.
Dissolved Raw Bone.
Emmert's Half and Half.
$26 Phosphate.

MOORE, DONOHO & CO., BALTIMORE, MD.

Natural Plant Food.

GEO. R. MOWELL, GLENCOE, MD.

S. C. Rock.
Standard Bone Phosphate.

J. B. NICHOLS & SON, BALTIMORE, MD.

Farmers' Friend.

NICKERSON FERTILIZER CO., EASTON, MD.

Bone and Potash.
Corn Guano.
High Grade Vegetable Compound.
Pure Fine Ground Bone.
Truck Guano.

NORTHWESTERN FERTILIZER CO., CHICAGO, ILL.

Horse Shoe Brand Ammoniated Dis. Bone.
Horse Shoe Brand Challenge Corn Grower.
Horse Shoe Brand Corn and Tomato Grower.
Horse Shoe Brand Fine Raw Bone.
Horse Shoe Brand National Bone Dust.
Horse Shoe Brand Potato Grower.
Horse Shoe Brand Prairie Phosphate.
Horse Shoe Brand Pure Ground Phosphate.
Horse Shoe Brand Ralston Bone Meal.

G. OBER & SONS, BALTIMORE, MD.
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MARYLAND

Agricultural Experiment Station.

BULLETIN NO. 41.

Test of Methods of Preparing and Feeding Corn Fodder.

COLLEGE PARK, MD.

SEPTEMBER, 1896.

MARYLAND

Agricultural Experiment Station.

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Correspondents will please notify the Director of changes in their post-office address, or any failure to receive the bulletins.

ADDRESS,

MARYLAND AGRICULTURAL EXPERIMENT STATION,

COLLEGE PARK, MARYLAND.

CORN FODDER.

EXPERIMENTS CONDUCTED TO DETERMINE THE BEST METHODS OF PREPARING AND FEEDING CORN FODDER.

By H. J. Patterson, B. S., Chemist.

SUMMARY OF ESSENTIAL RESULTS.

1.—A "mixed feed" made by wetting and mixing shredded corn fodder and grain together proved to be the best way to feed corn fodder.

2.—The "mixed feed" was more digestible and produced more flesh and milk than the same food fed separately and dry.

3.—There was less fodder wasted by feeding it as a "mixed feed" than by feeding fodder and grain separately and dry.

4.—The digestibility of shredded fodder was increased by feeding it wet.

5.—The amount of water consumed was about the same with the different methods of feeding.

6.—New process Western wheat bran is about as digestible as that produced under the old process.

7.—Cotton-seed hulls have less food value than corn fodder, and much less food value than clover hay.

CORN FODDER.

HOW SHALL CORN FODDER BE FED? A TEST OF METHODS OF PREPARING AND FEEDING CORN FODDER.

By H. J. Patterson, B. S., Chemist.

The experiments reported in this bulletin were conducted in order that the Station would be in a position to answer the many questions which have arisen in the minds of those who are feeding corn fodder, and also in order to give additional information to aid in the use of the principles which are set forth in Bulletin No. 20 of this Station.

The experiments conducted and treated of in this bulletin are as follows:

I. Determination of the amount of fodder wasted with different methods of feeding.

II. Determination of the effects of the manner of feeding upon the quantity of the product.

III. Determination of the effects of the manner of feeding upon the condition of the animals.

IV. Determination of the relative amounts of water consumed under different manners of feeding the fodder.

V. Determination of the digestibility of shredded fodder fed dry.

VI. Determination of the digestibility of shredded fodder fed wet.

VII. Determination of the digestibility of a ration of shredded fodder and wheat bran fed separately and dry.

VIII. Determination of the digestibility of a ration of shredded fodder and wheat bran fed separately—the bran dry and the fodder wet.

IX. Determination of the digestibility of a ration of shredded fodder and wheat bran mixed and wet.

X. Determination of the digestibility of wheat bran when fed alone.

XI. Cotton seed hulls.

In Bulletin No. 20 of this Station it was shown that the corn fodder grown in this state upon one acre contained more digestible matter than the grain from the same area; it was also shown that all parts of the fodder were valuable, and that the portions which were generally rejected and allowed to waste contained more valuable food material than the portions which were utilized, even where there was an attempt made to save and feed the fodder.

Since the time of conducting the experiments above referred to the attention of farmers have been frequently called to the value of corn fodder as food for cattle, sheep and horses, through the medium of station bulletins, lectures at farmers' meetings, the agricultural press and the advertising matter of fodder cutters and fodder shredders. These, together with the existing circumstances of short hay crops, have worked a revolution with many farmers in the manner in which they save, utilize and feed corn fodder. This change of policy toward corn fodder has caused many tons of fodder to be utilized and turned into some profit to the growers; yet it is probable that the increased acreage in corn still leaves as much as ever uncared for and going to waste. The area in corn this year means a production of more than one hundred million tons of fodder. This, if utilized, should mean as many million dollars to the producer.

Maryland produces yearly enough corn fodder to maintain all the cattle and sheep in her borders, and still have a surplus. This surplus should not be a waste on the farm, but should go to maintain more stock.

By keeping stock the farmer would be able not only to convert corn fodder which is now going to waste into dairy products and meat, but at the same time would convert the plant foods of the fodder into a form which would rapidly decompose and become available for succeeding crops, and also produce a change in the undigested organic matter, which, when added to the soil, would make it a better home for nitrifying organisms and promote their growth.

Circumstances have caused the farmers of many sections of Maryland to go into dairying, who a few years ago devoted their energies to some of the staple agricultural crops. This changed condition necessitates having a greater amount of food for the cows. Naturally, the farmer should look to utilizing that which is produced on the farm; and none of the crops will give so much food for the dairy herd as the corn crop when all of it is prepared and put in shape for feeding. This desire on the part of those seeking the best methods brings to us the questions which are being discussed by feeders in connection with the problem of feeding corn fodder. *How should corn fodder be fed? What is the best manner of preparing and making the valuable food compounds which are stored up in corn stalks into a form palatable and nourishing to stock? How shall fodder be prepared so as to utilize most completely?* These have been the questions which incited and called forth the experiments recorded on the following pages.

I. DETERMINATION OF THE AMOUNT OF FODDER WASTED WITH DIFFERENT METHODS OF FEEDING CORN FODDER.

Determination of the relative amounts of the different parts of corn fodder showed that sixty pounds out of every one hundred pounds were stalks. thirty pounds blades and ten pounds husk. Every farmer and person who has attempted to feed corn fodder knows that the cattle eat but little of the stalk proper. generally eating nothing more than the blade and husk. Thus it will be safe to calculate that 50% of the fodder. when fed in its natural state, would be a waste product. Consequently in this discussion it was not deemed necessary to conduct any extensive experiments with whole fodder, but to take up at once the work after the fodder has been prepared in the most approved manner for feeding.

OUTLINE OF EXPERIMENT.

The experiment under discussion was undertaken to obtain some definite and reliable data from a comparison of the two methods of feeding fodder to cattle as practiced by different farmers. The methods being: First, that of feeding the cut fodder dry and alone as hay is fed, which is the method commonly used. The second method is to wet the fodder and thoroughly mix the grain with it. This method is claimed to give better results as to milk or flesh produced, and also a less amount of waste fodder.

Nine cows were used in the test; four in Lot A, and five in Lot B. During the first period of the experiment the fodder and grain were fed separate and dry to Lot A, and to Lot B they were thoroughly mixed and wet. During the second period of the experiment the manner of feeding to the two lots was the reverse of that of the first period.

The first period lasted through 32 days, and the second period through 25 days.

FEED USED AND MANNER OF PREPARATION.

The fodder used in this experiment was grown on the Experiment Station farm, and soon after husking the corn, the fodder was hauled in and stored in the barn. It kept bright and perfectly sweet. The fodder was prepared for feeding by cutting it with a "Tornado" cutter, which not only cuts but splits the stalks and shreds the leaves and husks.

During the test it was aimed to give each animal all she would eat. The grain ration given the cows consisted of a mixture of equal parts by weight of corn and cobmeal, wheat bran and "King" gluten meal—giving each cow 10 pounds per day of this mixture.

In mixing the feed the grain and fodder were thoroughly mixed and wet with water. The mixing was generally done about one feed (12 hours) ahead. When the weather was warm the feed was mixed only two or three hours before feeding, as a longer period would sometimes cause it to sour.

[TABLE I.—RESULTS OF THE TESTS.

Shredded corn fodder and grain ration fed separate and dry.

	No of cows in Experiment.	Duration of Experiment.	Qnantity of fodder fed per day.	Total fed.	Quantity of refuse or wasted Fodder.	Per-cent. Wasted.
		days.	lbs.	lbs.	lbs.	
Lot A.	4	32	41	1312	153	11.6
Lot B.	5	25	46	1150	167	14.5
					Average	13.0

Shredded corn fodder and grain ration thoroughly mixed and wet.

Lot B.	5	32	46	1472	141	9.6
Lot A.	4	25	41	1025	52	5.1
					Average	7 3

This gives a gain in favor of feeding the grain and fodder mixed and wet of 6.7 per cent., or, in other words, in feeding a ton of shredded fodder there is a waste of 260 pounds, while feeding it as mixed feed there is only 134 pounds wasted, or, approximately, but one-half the waste.

II. DETERMINATION OF THE EFFECTS OF THE ABOVE TWO WAYS OF FEEDING UPON THE QUANTITY OF PRODUCT.

The cows used in these experiments were native and grade animals, or such animals as make up an average herd. They were divided as nearly as possible, all things considered, into two lots so as to obviate difference as to period of lactation, etc.

The following are the results as to the yield of milk from the individual cows when fed the different ways, as indicated in Experiment I.

TABLE II.—YIELD OF MILK DURING TWENTY-FIVE DAYS OF EACH METHOD OF FEEDING.

Cow No.	Fodder and Grain fed Separate and dry.	Fodder and Grain mixed and fed wet.
	lbs.	lbs.
1	342.5	342 5
2	264 5	296 0
5	375.5	472.5
6	389.0	385.5
7	432.5	420.0
8	478.5	427 0
9	492.0	474.5
10	504.5	517.5
11	430 5	419.0
Total	3709.	3754 5

The results from the yield of milk shows a small total gain in favor of the mixed ration, while individual cases show a loss when fed the "mixed feed." As there is a maximum production for every cow, and no conditions are able to change that amount very materially, and in this test the yields showed but little advantage, it may be well to look next at the comparative condition of the cows at the end of the time of feeding the different ways.

III. EFFECT OF THE ABOVE WAYS OF FEEDING UPON THE CONDITION OF THE ANIMALS.

This portion of the work consists simply of a record of the weights of the animals at the beginning and end of experiments. The weights are the result of single weighings, and while they cannot be considered exact or the change in weight considered to be entirely due to flesh, yet as the animals were weighed in as nearly the same condition as to time of feeding, watering, etc., at the different times as it is possible to have them, the weights can be considered to approximate the facts.

The weights were as follows:

Cow No.	At end of period when fodder and grain were fed separate and dry.	At end of period when fodder and grain were mixed and wet.	Gain in favor of mixed ration.
	lbs.	lbs.	lbs.
1	705	750	45
2	626	635	9
5	717	727	10
6	760	816	56
7	663	701	38
8	688	768	80
9	735	820	85
10	750	798	48
11	660	723	63

From these figures it will be seen that there was a general improvement in favor of mixing the grain with fodder, together with water. It will also be noted on a comparison of tables II. and III. that the cows which gained most flesh gave the least milk, and vice versa.

IV. DETERMINATION OF THE RELATIVE AMOUNTS OF FOOD AND WATER CONSUMED UNDER DIFFERENT METHODS OF FEEDING.

In the determination of this point the date was obtained from the amounts of water consumed by steers under digestive experiments, the results of which are reported under subsequent heads.

In this experiment the animals were offered the same amount of food each day. The amount being that which preliminary tests showed the animals would eat, but any left uneaten was weighed and recorded. There was a fixed amount of water used each time in the mixing of the feed, and in addition to this the steers were given, morning and evening, all the water they would drink.

The results were as follows:

Food consumed by two steers in 14 days:
  When fodder and grain were fed separate and dry......388 pounds.
  When fodder and grain were fed mixed and wet......398 pounds.
Water consumed by two steers in 14 days:
  When fodder and grain were fed separate and dry....1,043 pounds.
  When fodder and grain were fed mixed and wet (mixed with food 317 lbs., drunk 752 lbs.)............1,069 pounds.

This test was made during March in a stable where the average daily temperature at that time in the year varied but little.

From the above results it will be seen that the mixing will not cause the animals to actually consume more food, but only to cause less waste of that which is given. Also, that the total amount of water consumed is about a constant thing.

DIGESTION EXPERIMENTS.

Figures obtained from amounts eaten and refused, and from yields and weights, are often of such a nature as to not be entirely decisive, and seldom point out or determine the reason for the results obtained; consequently, in order that the conclusions drawn from the above results might not be shadowed with doubt, digestion experiments were made by feeding fodder in different ways separately and in combination with a grain ration. These digestion tests were so planned as to give data on almost every phase of the question under discussion, and also planned with the expectation that the exact point of advantage or disadvantage in various methods would be indicated.

ANIMALS USED.

The animals used in the digestion experiments were four steers, which were bought in the Baltimore Stock Market. They showed a good breeding, probably a good percentage of short-horn blood. They were in good flesh, but not fat. These steers proved to be exceedingly well adapted to this work, as they were unusually easy to handle and had good appetites.

METHODS USED.

The apparatus used in the work was substantially the stall and harness for collecting the dung and urine as modeled by Dr. H. P. Armsby. The general method of procedure was practically the same as described in the Fourth Annual Report and Bulletin No. 26 of this Station.

FEED USED.

The corn fodder used in these digestion experiments was prepared by cutting and shredding on the "Tornado" fodder cutter, and was the same kind of fodder as used in feeding the cows described in the first part of this bulletin. In harvesting the fodder was cut off at the ground, so that the shredded fodder represented the entire plant, less the ears. The wheat bran used was a good grade of Western bran of medium fineness.

The several digestion trials are discussed under heads V.-X., which immediately follow.

The following are the analyses of the samples used in the digestion work. The methods used were those of the A. O. A. C.

TABLE IV.—COMPOSITION OF FODDER AND GRAIN FED AND DUNGS EXCRETED IN DIGESTION EXPERIMENTS.

Index No.	DESCRIPTION OF SAMPLES.	Water	Ash.	Crude Protine.	Crude Fiber.	N-free Extract.	Fat.
		Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct	Per Ct.
1747	Shredded Corn Fodder...............	20.10	4.60	4.31	28.29	40.33	2.37
1753	Wheat Bran...................	13.26	5.24	17.77	9.51	48.22	6.00
1760	Dung Steer 3, Experiment V........	83.56	1.50	1.21	4.80	8.62	0.31
1761	" " 4, " V.........	84.40	1.54	1.19	4.48	8.09	0.30
1768	" " 1, " VI.........	85.16	1.46	1.26	4.27	7.57	0.28
1769	" " 2, " VI	84.83	1.60	1.34	3.90	8.03	0.30
1778	" " 3, " VII......	82.60	1.92	1.78	4.39	8.56	0.75
1779	" " 4, " VII.......	82.26	1.85	1.62	5.03	8.63	0.61
1786	" " 1, " VIII......	80.50	2.25	1.83	5.04	9.63	0.75
1787	" " 2, " VIII.....	82.89	1.95	1.85	4.23	8.44	0.64
1796	" " 3, " IX.......	82.14	1.95	1.83	4.43	8.58	1.07
1797	" " 4, " IX........	83.37	1.66	1.50	4.47	8.52	0.48
1806	" " 1, " IX...	80.36	2.07	1.94	5.50	9.25	0.88
1807	" " 2, " IX.......	82.46	2.11	1.57	5.00	8.18	0.68
1818	" " 3, " X........	83.85	1.78	1.78	3.79	6.78	2.02
1819	" " 4, " X.........	80.13	1.71	2.21	5.30	9.29	1.36

V.—DETERMINATION OF THE DIGESTIBILITY OF SHREDDED CORN FODDER FED DRY.

This portion of the work is, in a measure, a repetition of work which was done here and reported in Bulletin No. 20, and also similar to what has been done at other Experiment Stations. Yet for this particular work it was deemed advisable to repeat it, so that we would eliminate the differences which might arise from using other crops and animals; also, to have a test with the fodder prepared in precisely the same manner as that which was used in these experiments. Again, it is well in this sort of work to add strength by numbers of trial. The animals had been eating the corn fodder for some days before they were put on the experiment proper, and the preliminary period is put down from the time when the actual weights of feed were recorded, but in reality it was a much longer period.

Taking the composition of the fodder fed and the dungs excreted, together with the amounts eaten and excreted as given in the first column of the following table, we have the data given in the following table from which the digestion coefficients are calculated as indicated. The weights are recorded and given in the metric system for convenience of calculation. This point was not considered essential, as the results sought were to be records in per cents, and they would be the same under all methods of weighing. (453.6 grm.—1 pd.)

TABLE V.—DIGESTIBILITY OF THE COMPONENTS OF SHREDDED CORN FODDER, FED DRY.

Duration of preliminary feeding 5 days. Duration of Digestion period 6 days.

(*In grams, 453.6 grams=1 pound.*)

	Fresh Substance.	Dry Substance	Ash.	Protein.	Crude Fiber.	N-free Extract.	Fat.
STEER 3.	Grams.	Grams	Grams	Grams	Grams	Grams	Grams
Food Eaten (1747)	30510	24375	1403	1315	8630	12304	723
Total Excreted (1760)	63240	10390	948	765	3035	5446	196
Digested		13985	455	550	5595	6858	527
Per Cent. Digested		57.37	32.44	41.83	64.83	55.67	72.89
STEER 4.							
Food Eaten (1747)	30740	24560	1414	1325	8677	12415	729
Total Excreted (1761)	69050	10770	1063	821	3096	5583	207
Digested		13790	351	504	5581	6833	522
Per Cent. Digested,		56.14	24.82	37.96	64.32	55.03	71.60
Average for 2 steers		56.75	28.63	39.89	64.57	55 35	72.24

VI.—DETERMINATION OF THE DIGESTIBILITY OF SHREDDED FODDER FED WET.

In this test the same kind of fodder was used as in the test where fodder was fed dry, and the fodder was prepared in the same manner and all the operations were conducted in the same way, the only difference being that the fodder fed the steers was thoroughly wet and allowed to stand some time before feeding. In wetting the fodder there was three parts of water used to four parts of fodder.

The steers used were the other two (Nos. 1 and 2,) and the results obtained are deemed perfectly comparable as they ate practically the same amounts and then where all the animals were used in the same digestion trials the average results as obtained with steer Nos. 1 and 2 were almost identical, at least in the essentials with those obtained with steers Nos. 3 and 4.

TABLE VI.—DIGESTIBILITY OF THE COMPONENTS OF SHREDDED FODDER FED WET.

Duration of Preliminary Feeding 12 Days.—Duration of Digestion Period 6 Days.

	Fresh Substance.	Dry Substance.	Ash.	Protein.	Crude Fiber.	N-free Extract.	Fat.
STEER 1.	Grams.	Grams.	Grams	Grams	Grams	Grams	Grams
Food Eaten (1747)	28960	23137	1332	1248	8191	11680	686
Total Excreted (1768)	59560	8838	870	750	2543	4508	167
Digested		14299	462	498	5648	7172	519
Per Cent. Digested		61.84	34.68	39.40	68.95	61.40	75.66
STEER 2.							
Food Eaten (1747)	29840	23840	1373	1286	8442	12032	707
Total Excreted (1769)	64300	9752	1028	861	2507	5163	193
Digested		14038	345	425	5935	6869	514
Per Cent. Digested		59.09	25.13	33.05	70.30	57.09	72.70
Average for 2 Steers		60.46	29.90	36.48	69.64	59.22	74.18

Bringing the coefficients obtained by feeding fodder dry and wet together for comparison we have.

TABLE VII.—COMPARISON OF DIGESTION COEFFICIENTS OBTAINED BY FEEDING SHREDDED CORN FODDER DRY AND WET.

Per Cents Digestible.

	Dry Substance	Ash	Protein	Crude Fiber	N-Free Extract	Fat
Fed Dry	56.75	28.63	39.89	64 57	55 35	72.24
Fed Wet	60.46	29.90	36.48	69 63	59 22	74 18

From these figures it is shown that the wetting of the fodder produces the effect of making the total dry substance more digestible. The difference resting chiefly in the higher coefficients for the carbonaceous portion. It will be noted that the protein in the wet fodder is a little less digestible than in fodder fed dry. The data at hand and theory show no reason why this hould be so.

VII.—DETERMINATION OF THE DIGESTIBILITY OF SHREDDED CORN FODDER AND WHEAT BRAN WHEN FED SEPARATELY AND DRY.

In this test the aim was to feed equal amounts of wheat bran and shredded fodder. The bran was fed, and as soon as it was eaten, which was generally within one half hour, the foddder was given and the animals had 10 to 12 hours in which to eat this portion of their ration.

The compositions of material fed and dungs excreted are given in table IV, which furnish the data for the calculation of the coefficients as given in the following table.

TABLE VIII.—DIGESTIBILITY OF A RATION OF SHREDDED CORN FODDER AND WHEAT BRAN WHEN FED SEPERATELY AND DRY.

Duration of preliminary feeding 8 days. Duration of Digestion Period 6 days

	Fresh Substance.	Dry Substance.	Ash.	Protein.	Crude Fiber.	N-free Extract.	Fat.
STEER 3.	Grams.	Grams.	Grams	Grams	Grams	Grams	Grams
Fodder Eaten (1747)	19200	15337	883	827	5431	7741	455
Grain Eaten (1753)	19200	16650	1006	3412	1826	9254	1152
Total Eaten	38400	31987	1889	4239	7257	16995	1607
Total Excreted (1778)	70880	12330	1360	1261	3111	6067	531
Digested		19657	529	2978	4146	10928	1076
Per Cent. Digested		61.45	28.00	70.25	57.13	64.30	66.96
STEER 4.							
Fodder Eaten (1747)	20900	16688	961	901	5912	8419	495
Grain Eaten (1753)	21000	18215	1105	3732	1997	10121	1260
Total Eaten	41900	34903	2066	4633	7909	18540	1755
Total Excreted (1779)	86510	15349	1600	1401	4352	7468	528
Digested		19554	466	3232	3557	11072	1227
Per Cent. Digested		56 02	22.56	69.76	44.97	59.72	69.91
Average for Two Steers		58.74	25.28	70.00	51.05	62.05	68.44

VIII.—DETERMINATION OF THE DIGESTIBILITY OF A RATION OF SHREDDED CORN FODDER AND WHEAT BRAN: FODDER FED WET—BRAN FED DRY.

The fodder was prepared for feeding and wet in the same manner as described under VI., and the wheat bran was fed as in VII., all remaining factors in the several tests remaining constant.

The following are the results:

TABLE IX.—DIGESTIBILITY OF A RATION OF SHREDDED CORN FODDER AND WHEAT BRAN.

(FODDER FED WET AND BRAN FED DRY.)

Duration of preliminary feeding 6 days. Duration of digestion period 6 days

	Fresh Substance.	Dry Substance.	Ash.	Protein.	Crude Fiber.	N-free Extract.	Fat.
STEER 1.	Grams.	Grams.	Grams	Grams	Grams	Grams	Grams
Fodder Eaten (1747)...........	11670	9324	537	503	3302	4705	277
Grain Eaten (1753)..................	12000	10410	629	2132	1141	5788	720
Total Eaten.............	23670	19734	1166	2635	4443	10493	997
Total Excreted (1786).............	45390	8850	1021	831	2287	4371	340
Digested...........................		10884	145	1804	2156	6122	657
Per Cent. Digested...........		55.15	12.44	68.46	48.53	58.34	65.91
STEER 2.							
Fodder Eaten (1747)....	24000	19175	1104	1034	6790	9678	569
Grain Eaten (1753)...........	24000	20817	1258	4265	2282	11572	1440
Total Eaten.........................	48000	39992	2362	5299	9072	21250	2009
Total Excreted (1787)..............	81700	13978	1593	1511	3456	6895	523
Dilested		26014	769	3788	5616	14355	1486
Per Cent. Digested.................		65.05	32.56	71.48	61.90	67.55	73.96
Average for 2 Steers................		60.10	12.50	69.97	55.22	62.95	69.64

IX.—DETERMINATION OF THE DIGESTIBILITY OF A RATION OF SHREDDED CORN FODDER AND WHEAT BRAN WHEN FED WET AND MIXED.

During this portion of the test the feed for the steers was prepared by mixing the grain and fodder together and wetting, the manner of procedure being the same as that described under the preparation of the feed for the cows. See page 128.

In this part of the work all four steers were used in order to have data for checking the other parts of the work. The foods used were from the same lots as that used in the other tests.

Using the data given in Table IV. for the calculations, we obtain the following results:

TABLE X.—DIGESTIBILITY OF SHREDDED CORN FODDER AND WHEAT BRAN FED WET AS MIXED FEED.

Duration of preliminary feeding 7 days. Duration of digestion period 6 days.

	Fresh Substance.	Dry Substance.	Ash.	Protein.	Crude Fiber.	N-free Extract.	Fat.
STEER 1.	Grams.	Grams.	Grams	Grams	Grams	Grams	Grams
Fodder Eaten (1747)	20830	16642	958	898	5893	8398	493
Grain Eaten (1753)	24000	20817	1258	4265	2282	11572	1440
Total Eaten	44830	37459	2216	5163	8175	19970	1933
Total Excreted	71670	14075	1483	1390	3944	6628	630
Digested		23384	733	3773	4231	13342	1303
Per Cent. Digested		62.43	33.08	73.08	51.76	66.81	67.41
STEER 2.							
Fodder Eaten	24000	19175	1104	1034	6790	9678	569
Grain Eaten	24000	20817	1258	4265	2282	11572	1440
Total Eaten	48000	39992	2362	5299	9072	21250	2009
Total Excreted (1807)	83360	14620	1759	1309	4168	6817	567
Digested		25372	603	3990	4904	14433	1442
Per Cent. Digested		63.44	25.53	75.29	54.03	67.92	71.78
STEER 3.							
Fodder Eaten	21000	16779	966	905	5940	8470	498
Grain Eaten	21000	18215	1105	3732	1997	10121	1260
Total Eaten	42000	34994	2071	4637	7937	18591	1758
Total Excreted (1796)	75930	13561	1480	1389	3366	6514	812
Digested		21433	591	3248	4571	12077	946
Per Cent Digested		61.25	28.54	70.05	57.59	64.96	53.24
STEER 3.							
Fodder Eaten	21000	16779	966	905	5940	8470	498
Grain Eaten	21000	18215	1105	3732	1997	10121	1260
Total Eaten	42000	31994	2071	4637	7937	18591	1758
Total Excreted (1797]	72350	12031	1201	1085	3234	6164	347
Digested		22963	870	3552	4703	12427	1411
Per Cent. Digested		65.62	42.01	76.60	59.25	66.84	80.26
Average for 4 Steers		63.19	32.29	73.76	55.67	66.63	68.17

Bringing the data obtained in VII., VIII. and IX. together for comparison, we have the following:

TABLE XI.—AVERAGE COEFFICIENTS OF DIGESTIBILITY OF A RATION OF CORN FODDER OBTAINED BY DIFFERENT WAYS OF FEEDING.

Percents Digestible.

Ration and Manner of Feeding.	No. of Steers in test.	Dry Substance	Ash	Protein.	Crude Fiber.	N—free Extract.	Fat.
VII. Corn fodder and wheat bran fed seperately and dry.	2	58 74	25.28	70.00	51 05	62.05	68.44
VIII. Corn fodder fed wet wheat bran fed dry.	2	60.10	12.50	69.97	55.22	62.95	69.94
IX. Corn fodder and wheat bran mixed and fed wet.	4	63.19	32.29	73.76	55.67	66.63	68.17

From the above table it will be seen that there is but a small difference in digestibility when the grain and fodder are fed separately, whether the fodder is dry or wet; yet the difference is in favor of feeding the fodder wet—the difference being sufficient to warrant wetting. A comparison of either method of feeding grain and fodder separately with preparing them as mixed feed shows a decided advantage in favor of mixing, being about 4½ per cent. more dry substance digested and 3¾ per cent. more protein.

X.—DETERMINATION OF THE DIGESTIBILITY OF WHEAT BRAN.

The object of this experiment was twofold; first to determine the value of Western wheat bran, and second to serve as a check in reference to the previous experiments.

The question of the value of Western wheat bran is of considerable importance to dairymen, as the bulk of the bran on the market comes from the West; and it is not uncommon to hear dairymen say that "Western bran" is of very poor quality and is not nearly so good as Eastern and old-fashioned bran, and some go so far as to say that for feeding purposes it is but little better than saw dust.

During the time of this experiment the animals were fed entirely on the bran, no other food being given. The composition of the bran fed in this test is given in Table IV.. and by the use of these figures with the composition of the dungs, together with the amounts of food eaten and dung excreted, we have the following results:

TABLE XII.—DIGESTIBILITY OF WESTERN WHEAT BRAN.

Duration of preliminary feeding 6 days. Duration of digestion period 6 days.

	Fresh Substance	Dry Substance	Ash	Protein	Crude Fiber	N-free Extr't	Fat
STEER 3.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Food Eaten (1753).	36000	31225	1886	6398	3424	17357	2160
Total Excreted (1818)...........	61240	9890	1090	1090	2321	4152	1237
Digested..........................		21335	796	5308	1103	13205	923
Per Ct. Digested.		68.33	42.21	82.96	32.21	76.08	42.73
STEER 4.							
Food Eaten.........................	30000	26020	1572	5330	2853	14465	1800
Total Excreted (1819).............	44130	8768	754	975	2340	4099	600
Digested............................		17252	818	4355	513	10366	1200
Per Ct. Digested.........		66 30	52 04	81.71	17.98	73.05	66.67
Average for 2 steers		67.32	47.13	82.33	25 10	74.57	54.70

From the results above we see that Western wheat bran shows not only a good analysis, but that the components are quite digestible, especially the protein and nitrogen-free extract (starch and sugar), which are the valuable portions of bran.

In order to compare the value of this bran with that of the old process and Eastern bran, in the following table are given the coefficients as obtained in America and Europe.

TABLE XIII.—DIGESTION COEFFICIENTS FOR WHEAT BRAN.

Kind of Bran add Place Tested.	Dry Substance	Ash	Protein	Crude Fiber	N-free Extract	Fat
Western wheat bran, Maryland	67	47	82	25	75	55
Western wheat bran, Mass.	64	... ...	78	28	71	65
Wheat middlings, Maine	75	....	79	....	83	85
Wheat bran, Europe	... .	.....	88	20	80	80

COTTON SEED HULLS.

During the past few years, on several occasions, the attention of the Station has been called to the fact that dairymen in a number of sections of the state had been purchasing cotton seed hulls to feed to their cows. The general impression which prevailed in regard to the value of the hulls, and which was received from the agents selling them, was to the effect that they were a rich food and would take the place of wheat bran and other nitrogenous by-products. The price paid for the hulls ranged from ten to fifteen dollars per ton.

The following table gives the composition of a sample of hulls sold in this state, together with the composition of some other feeds:

TABLE XIV.—COMPARISON OF THE COMPOSITION OF COTTON SEED HULL WITH THE COMMON FEEDS OF THE FARM.

	Water	Ash	Protein	Crude Fiber	N—free Extract	Fat.
	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.
Cotton seed hulls......	9.25	3.10	8.14	39.45	37.26	2.80
Corn fodder..................	20.10	4 60	4.31	28 29	40.33	2.37
Clover hay.................... ..	15.30	6.20	12.30	24 80	38.10	3.30
Wheat bran.................. .	13.26	5.24	17.77	9 51	48.22	6.00

In order to make a more thorough comparison of the value of these feeds than the composition alone will give, turn next to their digestion coefficients, as given in the following table:

ABLE XV.—COMPARISON OF THE DIGESTIBILITY OF COTTON SEED HULLS WITH COMMON FEEDS OF THE FARM.

	Dry Substance	Ash	Pro-tein	Crude Fiber	N—free Extract	Fat
Cotton seed hulls (N. C. & Tex.)......	41	24	10	38	40	77
Corn fodder (fed dry, this bul.).......	57	29	40	64	55	72
Clover hay (Maine & Wis.)......	66	58	73	61	69	51
Wheat bran (this bulletin)............	67	47	82	25	75	55

From these tables we see that the cotton seed hulls contain much less digestible matter than any of the other foods, and an examination shows that it contains less than one-half as much digestible protein as corn fodder, or, in other words, each hundred pounds of corn fodder has over twice as much digestible protein as the cotton seed hulls; *yet many Maryland farmers have bought cotton seed hulls and allowed their corn stocks and fodder to go to waste.* Again, some farmers have sold clover hay and others have refused to buy it at eight to ten dollars per ton, and bought cotton seed hulls at higher prices, not knowing that the hay was very much more valuable and contained over ten times as much digestible protein.

METHODS OF FEEDING COTTON SEED HULLS IN SOUTH.

In the South, and particularly when cattle are fed at the cotton seed mills, the practice is to haul the hulls out in large piles in the cattle yards, and the cattle eat them just as they do straw at the straw stacks in this section.

CONCLUSION.

The results obtained and reported upon in the preceding pages show that by wetting and mixing the shredded corn fodder with the grain ration that there is more complete consumption of the fodder (there being but half as much waste matter) than when the fodder and grain are fed dry and separate. The method of mixing produced more milk and kept the animals in better flesh, which is a very important factor in successful dairying.

The wetting of the fodder when fed alone, and also when fed with grain, made it more digestible. The method of feeding the ration as a "mixed feed" gave a larger percentage of digestible matter than any of the methods tested. From these facts it is safe to say that the method of making a mixed feed of a ration is the best method to adopt in order to have the most complete consumption and the best returns for the food consumed.

The results of the digestion experiment show Western wheat bran to be far better than commonly supposed, and also that it is nearly as digestible as old process bran.

Cotton seed hulls are shown to have less feeding value than the corn fodder which is being wasted on farms where hulls are being purchased at ten to twelve dollars per ton.

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MARYLAND

Agricultural Experiment Station.

SPECIAL ISSUE.

BULLETIN NO. 42.

The Maryland Trees and Nursery Stock Law and Other Information of Special Interest to Nurserymen and Fruit Growers.

COLLEGE PARK, MD.

OCTOBER, 1896.

MARYLAND
Agricultural Experiment Station.

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NOTICE.

The State Entomologist, appointed in accordance with the "Trees and Nursery Stock" law, is Professor of Entomology in the Maryland Agricultural College and Entomologist in the Maryland Agricultural Experiment Station. In addition to the publication of the regular bulletins, embodying the results of the experimental work and investigations of the entomologist, it is the purpose of the Agricultural Experiment Station to issue special bulletins on economic subjects requiring immediate notice, covering his work as State Entomologist.

The bulletins of the Station will be mailed free to any citizen of Maryland who sends his name and address to the Station for that purpose.

Correspondents will please notify the Director of changes in their post-office address, or any failure to receive the bulletins.

MARYLAND AGRICULTURAL EXPERIMENT STATION,
COLLEGE PARK, MD.

LETTER OF SUBMITTAL.

MARYLAND AGRICULTURAL EXPERIMENT STATION,
DEPARTMENT OF ECONOMIC ENTOMOLOGY,
College Park, Md., October 20, 1896.

Sir:—I have the honor to submit herewith a special bulletin containing information pertaining to the Maryland Trees and Nursery Stock law, embodying a special report on the present status of the San Jose scale, Peach Yellows, and other injurious insects and plant diseases in this State.

Very truly yours,

W. G. JOHNSON.

To Robert H. Mitler, Esq.,
Director, Maryland Agricultural Experiment Station.

THE MARYLAND TREES AND NURSERY STOCK LAW AND OTHER INFORMATION OF SPECIAL INTEREST TO NURSERYMEN AND FRUIT GROWERS.

By W. G. Johnson, A. M., Entomologist.

INTRODUCTION.

In the performance of my duties as State Entomologist inspecting the nurseries of the state, and investigating other entomological and botanical questions of economic importance, I have found many nurserymen, dealers in nursery stock, and other persons who were not cognizant of the fact that our last General Assembly passed an Act known as the "Trees and Nursery Stock" law providing for the suppression of dangerous insect pests and plant diseases already established within the State, and the prevention of future introduction from outside sources.

It is the purpose of this special bulletin to furnish special information regarding the new law; to give a brief summary of the present condition of the nurseries and orchards of the State, referring especially to the San Jose Scale and Peach Yellows; to give the salient characteristics by which these pests may be recognized, together with the remedies for their destruction and suppression.

TREES AND NURSERY STOCK LAW.

In accordance with the provisions of this Act it is the duty of the State Entomologist to inspect all nurseries of the State each year, with a view of detecting any injurious insects or plant diseases that might be disseminated by the distribution of nursery stock. Whenever any insect pest or disease is discovered, the owner is notified and the proper remedies for its destruction are suggested. If he does not apply the remedies for its suppression in the time specified, he lays himself liable to a fine of $1.00 for every tree, shrub, vine or plant shipped from his nursery. The entomologist can enter the premises in such a case, employ such assistants as he needs, and apply the remedies for the destruction of the pest at the expense of the owner. If the nursery stock is found to be free from dangerous insect pests and plant diseases, the owner is furnished with a certificate to that effect. The owner is further required to send on every package shipped or delivered, as well as transmit to the purchaser by mail, a certificate, signed by him, that the stock has been examined by the State Entomologist and that it is free from dangerous insect pests and plant diseases. Failure to furnish such a certificate shall render him liable to a fine of $100.00 for each and every such shipment of delivery.

Another very important section of the law provides for a certificate which shall be affixed on every package of trees, shrubs, vines or plants shipped into the State of Maryland from any other State, showing that the contents have been examined by a State or Government officer, and are free from insect pests and plant diseases. Upon satisfactory proof that the provisions of this Act have been violated the packages shall be returned to the shipper, unless the agent or consignee has the stock examined by the State Entomologist, who shall furnish the necessary certificate in case no dangerous insect or plant disease is found. In consequence of a failure to have the stock returned or to have it examined by the State official, it shall be seized and burned.

Every person within this State who has bought or contemplates buying nursery stock of any kind this fall or next spring should bear in mind the provisions of this Act, and insist on a certificate of inspection covering each and every package. Especial attention should be paid to nursery stock coming from outside the State. The dangerous San Jose scale in nine-tenths of the infested districts of this State has been traced to trees coming from other States. Too much care cannot be taken in this matter, and if there is the least suspicion that the stock is not as represented, upon notification, I will proceed to the premises designated and make the necessary examination of the material in question.

I have suggested that nurserymen of this State use the following, or a similar form of certificate, on their shipping tags:

....1896.

I hereby certify that the trees or plants shipped to.. County of..., State of Maryland, have been duly examined by Prof. W. G. Johnson, State Entomologist, and pronounced by him as showing no indication of the presence of the San Jose scale, Peach Yellows, Rosette, or other dangerous insects or plant diseases that might be transferred on nursery stock from the nursery to the orchard or garden.

....

Consignor.

Several nurserymen outside this State have made inquiry regarding the Maryland law, and have had their nurseries examined by entomologists, copies of whose certificate have been placed on file in this office. If for any reason a purchaser buying nursery stock direct from the nursery, or through some local or traveling agent, should doubt the authenticity of the certificate attached to such stock, the matter should be referred to this office without delay.

Nurserymen should be exceedingly careful about buying buds or stock of any kind from nurserymen outside this State. One instance has come to my notice this season where the San Jose scale was brought into this State on buds bought from a nursery firm in a neighboring State. This should be a signal of alarm to other firms, and extra care should be taken in handling stock from other nurseries for filling orders that cannot be supplied from home nurseries.

It must be understood that my certificate of inspection does not cover all the nursery stock handled by nurserymen and dealers in this State. Some nurserymen, who grow large quantities of small plants, such as strawberries, advertise fruit trees, although none are grown by them. In such cases the stock should be covered by certificate, as provided by the law, before being accepted by the dealer; otherwise he lays himself liable to heavy fine if such stock is shipped in violation of this Act.

For the sake of those who are not familiar with the Maryland "Trees and Nursery Stock" law, I give it here in full.

TREES AND NURSERY STOCK LAW.

An Act to add to Article forty-eight of the Code of Public General Laws title Inspection, a new sub-title to be known as Trees and Nursery Stock, and seven sections thereunder to be designated Sections 51, 52, 53, 54, 55, 56 and 57, providing for the examination of trees, plants, vines and nursery stock, and to exterminate the San Jose scale, Rosette, Yellows and other diseases and insects.

Section 1.—Be it enacted by the General Assembly of Maryland, that there shall be added to Article 48 of the Code of Public General Laws, title Inspection, a new sub-title to be known as Trees and Nursery Stock, and seven new sections thereunder to be designated Sections 51, 52, 53, 54, 55, 56, 57.

51.—The Governor of Maryland shall once in every two years designate and appoint one of the Professors at the Maryland Agricultural College State Entomologist, who shall serve without pay other than that he may receive as professor at said College; but whose expenses shall be paid as hereinafter provided, whose duty it shall be to inspect any and all nurseries in the State of Maryland where any trees, plants, vines, or other nursery stock is grown between the first day of each March and the first day of September next succeeding, and he shall notify in writing the owner of such nursery, the Governor of this State and the President of the Agricultural College of the existence of any San Jose scale, Yellows, Rosette, or any other insect or disease which may effect the trees, vines, plants, or other stock in such nursery, and also notify the owner thereof in writing that he is required on or before a certain day to be named therein to take such measure as has been shown or proven to be effectual for the destruction of such San Jose scale, Yellows, Rosette, or other disease to destroy and exterminate the same.

52.—The owner of such nursery trees, vines, or nursery stock shall within the time specified in such notice take such steps for the destruction of such San Jose Scale or other insect or disease as will exterminate the same and he shall not ship or deliver any trees, plants, vines or other nursery stock effected with such disease or insect, under a penalty of a fine of one dollar for every tree, plant or vine so effected when shipped from such nursery, which fine may be collected by suit by the State's Attorney of the county in which such nursery is located; one-half to go to the informer, the balance to be paid to the Trustees of said Agricultural College.

53.—Whenever it shall happen that the State Entomologist shall give the notice heretofore required to the owner of a nursery for the destruction of the insects or diseases mentioned and the said owner shall fail or neglect to take the measures necessary for the destruction thereof within the time mentioned in the notice given him it shall be the duty of the State Entomologist to have the proper remedies applied to such nurseries for the destruction of such insects or diseases, and shall employ all necessary assistance and may enter the premises of the said owner of such nursery for the purpose of treating and exterminating such insects or diseases, and the said owner of such nursery shall be liable for the costs of such proceeding.

54.—Whenever a nurseryman or seller of trees, plants, vines or other nursery stock shall ship or deliver any such goods to any purchaser in this State he shall send on each and every package so shipped or delivered, as well as transmit to the purchaser by mail, a written or printed certificate signed by him that the whole and every part of such stock or goods have been examined by the State or Government Entomologist, and that the same is entirely free from all San Jose scale, Yellows, Rosette, and every other insect or disease whatever and failure to furnish such certificate shall render him liable to the penalty of a fine of one hundred dollars for each and every such shipment or delivery without such certificate.

55.—Whenever any nurseryman, fruit grower, or agriculturist in this State shall know or have good reason to believe that his trees, plants, or vines are effected with San Jose scale, Yellows, Rosette or any other insect or disease, he shall have the privilege and it shall be his duty to notify the State Entomologist thereof who shall at once proceed to the premises designated and examine the same and suggest and recommend the proper remedies for the destruction of the same, and give all information he can to aid in exterminating such insect or disease and instruct the owner thereof how to use the remedies he recommends.

56.—The said State Entomologist when he examines any trees, plants, vines, or nursery stock in the State under the provisions of this Act, and he finds such trees, plants, vines, or nursery stock is free from all San Jose scale, Yellow, Rosette or other disease or insect, he is hereby authorized and directed to make out and deliver in writing to the owner of such trees, plants, vines or nursery stock a certificate that he has examined such trees, plants, vines or nursery stock, and that he finds the same free from all San Jose scale, Yellows, Rosette or other disease or insect, and said State Entomologist shall also file a similar certificate with the Governor of the State and with the President of the said Agricultural College, which certificate shall at all times be subject to public inspection.

57.—The sum of five hundred dollars annually, or so much thereof as may be necessary, is hereby appropriated for the purpose of paying the expenses of the State Entomologist in the performance of his duties under the provisions of this Act, and the Comptroller is hereby dircted to issue his warrant upon the Treasurer for the said sum, and the State Entomologist shall make report to the Comptroller of the amount expended.

58.—Whenever any trees, plants or vines are shipped into this State, from another state, every package thereof shall be plainly labeled on the outside with the name of the consignor, the name of the consignee, the contents, and a certificate showing that the contents have been inspected by a State or Government officer, and that the trees, plants or vines therein contained are free from all San Jose scale, Yellows, Rosette and other injurious insect or disease. Whenever any trees, plants or vines are shipped into this State without such a certificate plainly fixed on the outside of such package the fact may be reported to any Justice of the Peace of this State, and said Justice shall issue a summons for the consignee of such package, and the agent of the consignor if he be known, to appear before him on a certain day, to be therein named, to show cause why such trees, plants or vines should not be seized as being in violation of the provisions of this Act, and on trial thereof, if said Justice be satisfied that the provisions of this Act have been violated, said Justice shall order said agent or consignee to return such package of trees, plants or vines immediately to the shipper or consignor; unless said consignee or agent shall forthwith have said trees, plants and vines examined by the State Entomologist of this State, and he certify to such Justice of the Peace that the said trees, plants or vines are free from all insect or disease, and if said agent or consignee shall fail to have such nursery stock examined by the State Entomologist, or fail to return such packages to the shipper or consignor thereof, then said Justice of the Peace shall order and direct the constable or sheriff to burn and destroy all such trees, plants and vines as have been shipped into this State in violation of law.

Section 2.—And be it enacted that this Act shall take effect from the date of its passage.

Approved April 2d, 1896.

PRESENT CONDITION OF NURSERIES.

The nurseries of this State are, on the whole, in prime condition. In the various nurseries visited, representing nearly every section of the State, about 2,900,000 trees and vines have been inspected and the necessary certificates furnished the owners. The San Jose scale has been located in three nurseries, and in every case, so far as my final inspection shows has been completely destroyed. In two instances, about three thousand trees, including several old peach, pear and plum-trees in the immediate vicinity, infested by the same pest, were dug up and burned. Fortunate for the owners, the infested material was confined to blocks several miles from the stock to be placed on the market this fall and next spring. So far as a careful examination revealed, I could not find any traces of the scale on the other trees. In the third instance the scale was found on several trees in a one-year-old pear orchard, planted within a few rods of a large block of nursery stock, principally plum. All the infested trees were dug up and burned, and the others will be treated with the whale-oil soap wash this fall. All the nursery trees in the immediate block will be treated with hydrocyanic gas as soon as they are dug, thus insuring the destruction of any insect that might have escaped unnoticed.

There need be no fear of getting the scale from nurseries in this State this fall or next spring, as every possible means for its extermination has been resorted to by the owners, and a very careful examination of the stock on my part, convinces me that the work has been successful. If nurserymen all over the country would take such an active part in the warfare against insect pests and plant diseases as have the nurserymen of this State the present season. I think it would be a comparatively short time before we could successfully control these pests so far as their distribution on nursery stock is concerned.

The present wide-spread distribution of the scale over the State makes it practically impossible to say that a locality free this season, will be free from the pest next year. Nurserymen, therefore, must be alert and on the constant lookout for this "prince of orchard pests," and take immediate steps for its suppression should it appear. In one instance, I found the scale this fall literally covering a lot of peach, pear and plum-trees less than a mile from a large nursery, where it has not been found. Every possible means are being tried to rid this region of the insect before it makes further progress in its distribution. The nurseryman himself has volunteered to uproot and burn all the infested trees in his neighborhood, prune and treat all suspicious ones with whale-oil soap, besides agreeing to replace all the uprooted trees with perfectly clean ones from his nurseries.

I have not found a single case of yellows on marketable stock within a nursery this season. In one place I discovered this disease in a peach orchard two years from the bud. The trees had been left in the block from which the stock was sold last season, and out of twenty-five trees, fully one-half had the yellows. I was told that the disease was very conspicuous early this season, and many of the badly infested trees had been cut down and burned. Fortunately, the owner had no peach-trees on his place for sale this season. All the infested trees were dug out and burned. At another place I found about fifty old peach-trees nearly dead with the yellows in the vicinity of a block of 30,000 peach seedlings that will be ready for market next fall. In this case also the infested trees were destroyed.

In several instances I have found blocks of pear and cherry-trees that had been almost completely defoliated by the pear-slug (Eriocampa cerasi). Nurserymen finding this insect appearing in their nurseries another season should bear in mind that the infested stock could be cleaned in a few hours by a thorough drenching with a decoction of white hellebore used at the ratio of one ounce in a gallon of water, or the plants may be dusted with the powder, undiluted or mixed with several times its own bulk of cheap flour. These insects are so easily killed it is gross negligence on the part of any nurseryman to allow his stock to become stunted and dwarfed by them.

The peach-borer (Sannina exitiosa) has also been found quite abundant throughout the State. It is not considered a dangerous insect in nurseries, but is very annoying and destructive in orchards. Whenever it is found in nursery stock it should be cut out and destroyed. Its presence can usually be detected by the gummy exudation at the base of the tree.

I have found the woolly apple-louse (Schizoneura lanigera), common in several nurseries. Wherever this insect occurs upon the roots, the trees should be destroyed if badly infested. It is not an uncommon thing to find the roots of infested trees one mass of knots. Such trees are not marketable and should be avoided. As it is not possible for an entomologist to be absolutely sure that the peach-borer and the woolly apple-louse are not present on nursery stock, unless he could see the entire lot of trees uprooted, it will be to the advantage of the buyer of peach and apple stock to pay particular attention to the borer in the peach and the louse on the apple.

A NEW DISEASE OF THE PEACH.

During the prosecution of my work inspecting nurseries, I have on three occasions come across blocks of peach seedlings that were in an unhealthy condition. The condition of the stock was not due to what is popularly known as Yellows or Rosette, or to any other disease that has been heretofore described so far as I can ascertain. Trees affected with this disease have a characteristic reddish tinge, due to the coloration of the underside of the leaves. The leaves have a tendency to roll upwards and inwards, thus exposing the undersurface. The reddish tinge appears first on the outer edge, gradually spreading over the entire under surface on badly infested stock, giving the trees a decidedly reddish appearance. I have not found it affecting any stock except peach.

Respecting the nature of this disease, I have been unable to associate any fungous or bacterial affection with it that could be identified as the cause. It seems very probable that the disease is due to certain soil conditions, and that the stunted growth is partly referable to an imperfect assimilation of plant food. In two instances the diseased stock is on rather low ground somewhat given to Frenching, a term familiar to agriculturists. In other places stock in the same unhealthy condition is on high ground, appearing here and there in irregular patches. It is not an uncommon thing to find a perfectly healthy tree growing in the midst of an infested block. In one block of trees budded last season fully 2500 were found in such feeble condition this fall they have been dug out and burned. (See Fig. 1.) The buds were from perfectly healthy stock, but budded on very unhealthy seedlings; the budded growth showing the same characteristic appearance as the seedlings themselves. On the other hand, buds from the same source budded on healthy seedlings made a fine, vigorous, untainted growth. (See Fig. 2.)

Whether this disease is communicable by budding unhealthy buds on healthy seedlings remains to be cleared up by actual trial. Experiments are now under way to settle this, and several other points regarding budding, vitality, and longevity of the diseased trees. Another experiment has been started to see whether or not seedlings in this diseased condition cannot be helped by treating the soil with lime to neutralize the acid, and stable manure or some commercial fertilizer to supply nitrogenous material.

Nurserymen who are selecting ground for planting peach should avoid all soils of an acid or sour nature. These soils can be located, usually, with considerable accuracy, if corn is planted in the field before it is

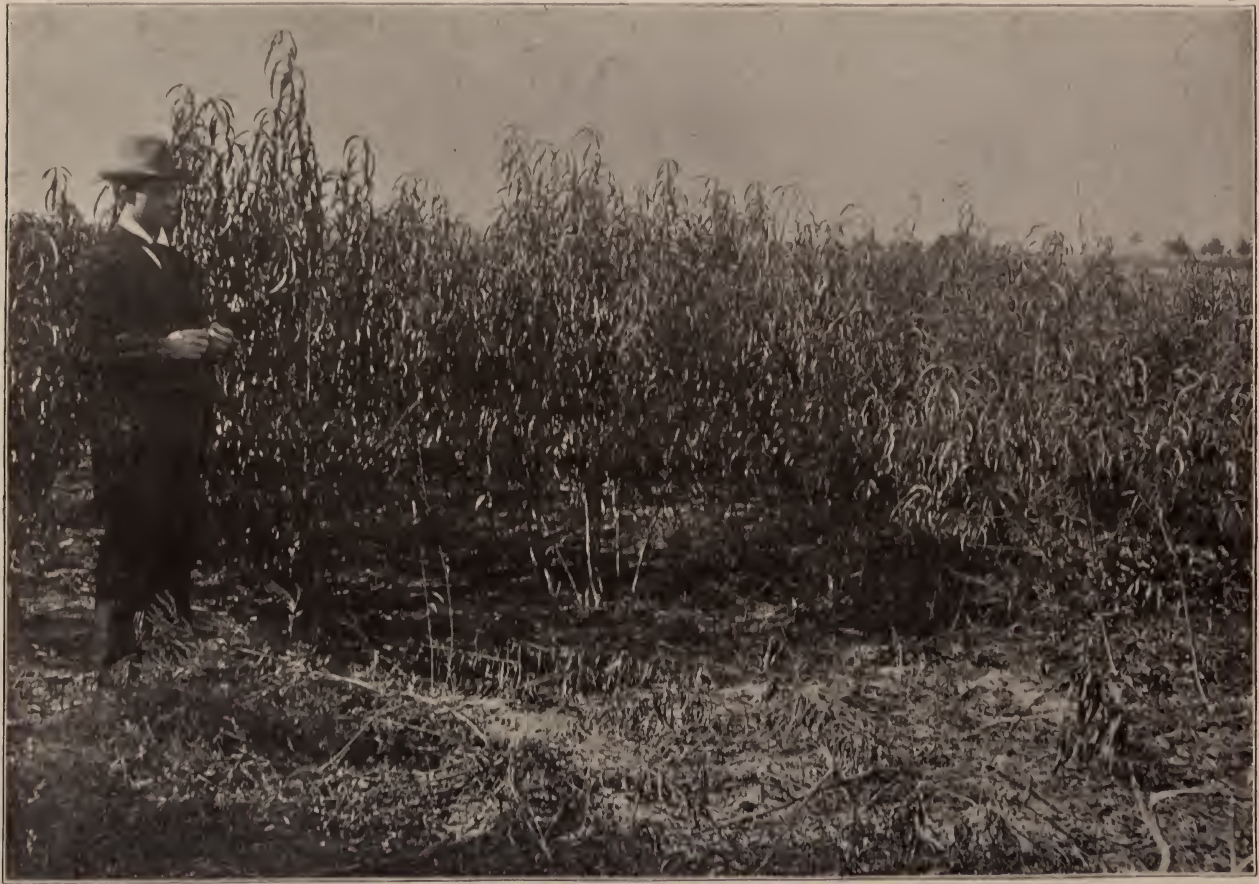

Fig. 1.—Diseased peach-trees one year from the bud. Healthy trees on the left; dwarfed and stunted trees on the right; trees pulled up and strewn about in the foreground.

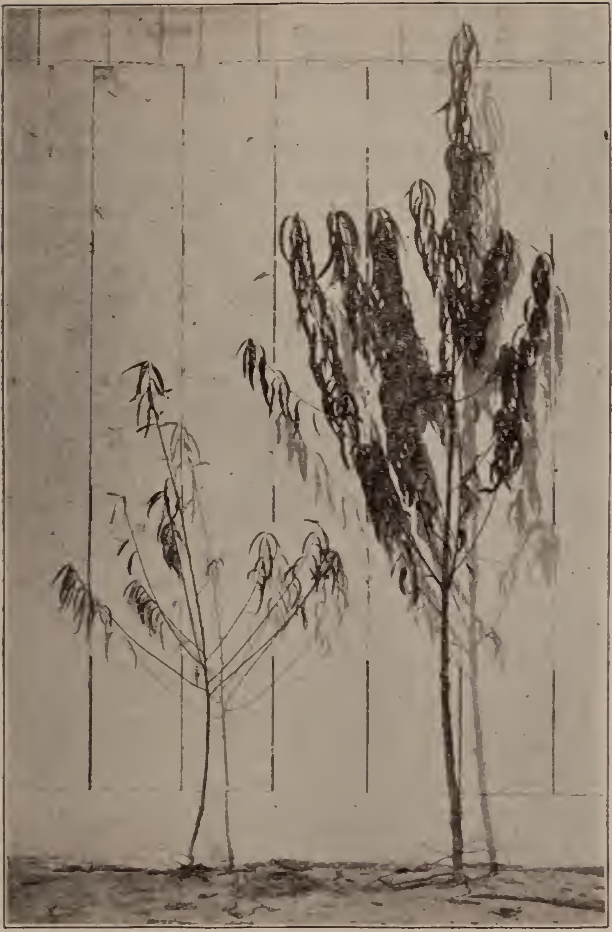

Fig. 2.—Peach-trees one year from the bud taken from same block. Diseased tree on the left and healthy tree on the right. Standing against a seven-foot fence.

used for nursery purposes. Spots where the corn is dwarfed and yellowish, or given to what is commonly called Frenching, should be avoided unless previously treated with lime, stable manure, or some commercial fertilizer and thoroughly drained.

PRESENT STATUS OF THE SAN JOSE SCALE IN THE STATE.

The San Jose scale has been definitely located in eleven counties of the twenty-three in the State. They are Garrett, Washington, Frederick, Carroll, Montgomery, Prince George's, Anne Arundel, Kent, Talbot and Dorchester. Garrett and Carroll counties were added to the list during my recent tour of inspection. No doubt there are many orchards within the State where the pest is working destruction that have not been reported to this office. The present status of the scale within the State is very much more alarming than was formerly supposed. It is still present in localities where it was supposed to have been eradicated, and is spreading with wonderful rapidity. In a large orchard in Kent county, where last fall nearly four hundred gallons of whale-oil soap were used, and where only half a dozen scales containing living insects were found this spring by an expert entomologist from the United States Department of Agriculture, after several hours search, I found the insects quite abundant on the trees in August of the present year, and in many instances the fruit itself was badly infested and discolored by them.

If we check the spread of this rapidly increasing pest, we must locate as speedily as possible all the infested orchards in the State and get to work at once. There are many orchardists, who are indifferent regarding this matter, thinking there is nothing to fear. These very men may realize too late, perhaps, that if it is the "survival of the fittest" in the "struggle for existence," the San Jose scale once established is the fittest thing in an orchard, unless it is handled systematically and scientifically. Wherever the scale has been located the owners are thoroughly alive to the interests at stake, and are doing all in their power to suppress it.

There has been so much published regarding this insect, it is not necessary to give in this place its life history and notes on its distribution. Any person desiring this information can secure a copy of Bulletin No. 32, of the Maryland Agricultural Experiment Station by addressing Director R. H. Miller, College Park, Md. The U. S. Department of Agriculture, Division of Entomology, at Washington, has recently published an excellent bulletin (No. 3, new series) on the San Jose scale by Dr. L. O. Howard and Mr. C. L. Marlatt.

In order that the pest may be readily recognized I will now give its salient characteristics, and trust the parties into whose hands this bulletin falls, will make a careful search in their orchards and on trees in their door yards or gardens and report to this office anything that may look suspicious. It is very necessary that we have all infested localities recorded.

HOW TO DETECT THE SAN JOSE SCALE.

Unless the scale is very abundant it is rather difficult to detect by the average observer. A badly infested twig under a hand lens appears as shown in Fig. 3 at b. The entire surface looks as if it was one mass of minute shells, varying in size from the diameter of a fine needle to that of a pin's head. If one of the larger scales be lifted with the point of a penknife, the insect, a small, oval, yellowish, waxy-looking mass, may be seen. During th summer the young orange-colored lice, mere specks, can be seen crawling over the twigs.

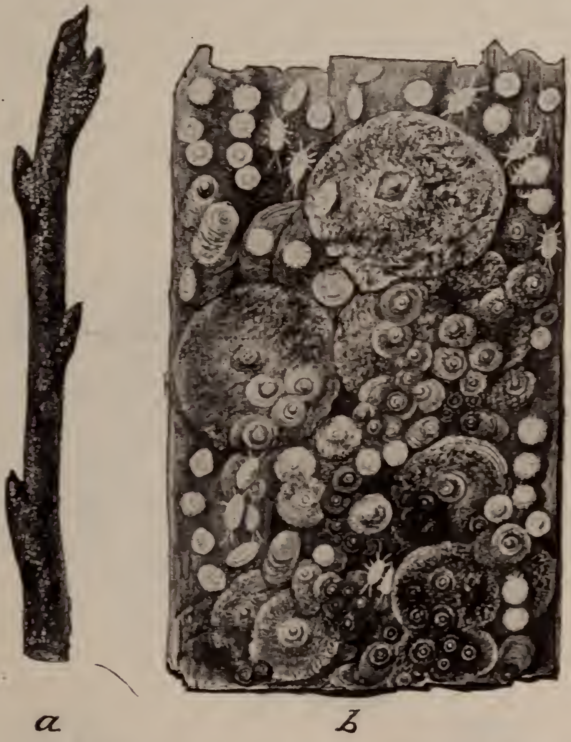

Fig. 3.—Appearance of scale on bark: a. infested twig, natural size; b. bark as it appears under hand lens, showing scales in various stages of development and young larvae (after Howard and Marlatt).

Oftentimes, certain twigs or branches on a badly infested tree, will die and lose their foliage before the rest of the tree succumbs. If any trees in an orchard or in a garden have been noticed in this condition, they should be carefully examined for scales. The bark of badly infested pear, apple or peach-tree is rather grayish, appearing as if it had been covered with ashes. When infested twigs are scraped with a knife blade or the thumb nail many insects are crushed giving rise to an oily yellowish liquid.

In looking for the scale on young pear-trees particular attention should be given to the extremities of the branches and twigs, as the insect has a tendency to infest such places more thickly than other parts of the tree. Leaves, as a rule, when infested, turn a purplish brown. The scale also has a peculiar effect upon the fruit, especially pear, causing an encircling band of reddish discoloration around each insect. This same reddish effect is also produced upon the bark and is a very serviceable characteristic used in inspecting stock where the scales are not very abundant.

This pest has a very wide range of food plants, attacking practically all our deciduous fruit trees, including various small fruits, such as the currant, gooseberry, etc., and many shade trees and ornamental shrubs.

The little black ladybird shown in Fig. 4, may be used to good advantage in detecting the presence of the scale. This little beetle is about the size of a pin's head, and may be seen running about an infested tree. Both it and its young, as shown in the illustration, feed upon the scale, usually the adult female.

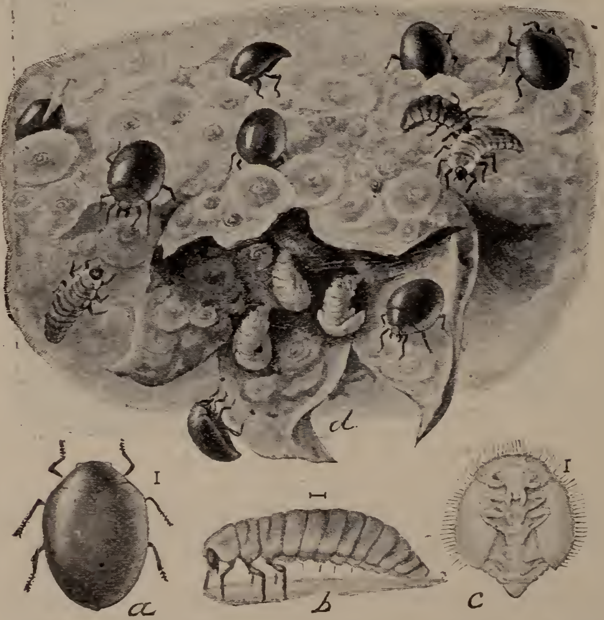

Fig. 4.—Ladybird and its young feeding upon the scale; a. beetle; b. larva; c. pupa; d. blossom end of pear covered with scales (after Howard and Marlatt).

Wherever these little lady-birds are seen crawling about the trunk or branches of a tree a careful search should be made for scale insects.

No measure is so sure as the uprooting and destruction of all stock known to be infested with the scale. In old orchards where it is desirable to save the trees, they should be sprayed soon after the leaves fall with whale-oil soap, dissolved in water at the rate of 2½ lbs. of soap to a gallon of water and applied hot. This treatment should be repeated in the spring just before the buds open.

PEACH YELLOWS.

This disease, peculiar to the peach and closely allied fruits, has been found over a large portion of the State. Up to the present time I have not seen it or had it reported from lower St. Mary's and Calvert or from Somerset, Worcester, Wicomico and Dorchester counties. It is to be hoped that by the careful selection of stock and close observation it may be kept from the orchards of this portion of the State. It has been particularly destructive in certain portions of Eastern, Central, Northern and Northwestern Maryland this season. I have already referred to its presence in the neighborhood of several nurseries.

There has been much speculation regarding the nature of this disease. It has not been associated with any bacterial or fungous organism or animal parasite that has been identified as the cause, and inasmuch as soil and climate do not seem to originate a plainly communicable malady, the discovery of the real cause still baffles the enterprise and intelligence of scientific investigators.

That it is a dangerous disease is no longer a matter of speculation. It is definitely known that trees with sound constitutions are subject to it, and that it acts very much like certain infectious diseases, and that once established in any locality, the rapid destruction of the orchards follow, unless it is taken in hand when it makes its first appearance.

It has been proven experimentally that the disease may remain dormant for some time in buds cut from affected trees and afterwards appear in the trees grown from such buds, as shown at b in Fig. 5.

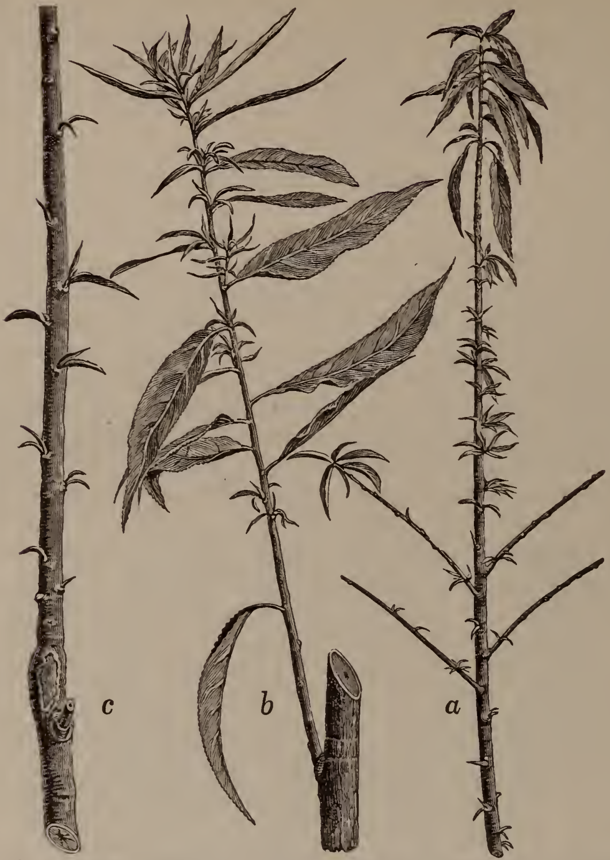

Fig. 5.—Peach Yellows. Winter buds unfolding in autumn (after Smith).

In this case the bud from which the shoot came was taken from a vigorous watershoot on a healthy looking branch of an affected tree in July, yet it contained the virus which, late in the season, produced the condition shown in the illustration. All of these buds would have remained dormant until the following spring had the shoot come from a healthy bud. It is not definitely known how long the disease will remain in a nursery without showing symptoms. It is not a rare occurrence however, to find it in nursery stock the year following the budding, and trees from the same nursery not showing signs of the disease, may develop it shortly after being set in orchards. A perfectly healthy tree may be completely destroyed in a short time by the insertion of a diseased bud. Fig. 5 c shows a stock shoot (seedling) to which the disease was transmitted by an inserted bud. It is not an uncommon thing for such a seedling under favorable conditions, to live three or four years; but growth is very slow. There is no doubt that yellows is transmitted in some other way than those mentioned above. In some districts the disease makes a clean sweep and it is hardly probable that all or even part of the trees had the disease when they left the nursery.

The most distinguishing and characteristic symptoms of yellows are (1) the prematurely ripe, red-spotted fruits; (2) the unfolding of leaf buds into pale, slender shoots, out of season; (3) the yellowing of the foliage; and (4) the broom-like growths, as shown in Fig. 6. In the autumn when the leaves have fallen it is not an uncommon thing to find trees filled with these pale-green, broom-like bunches as seen in the illustration (Fig. 4). These growths arise from old resting buds, which in perfectly healthy trees should remain dormant.

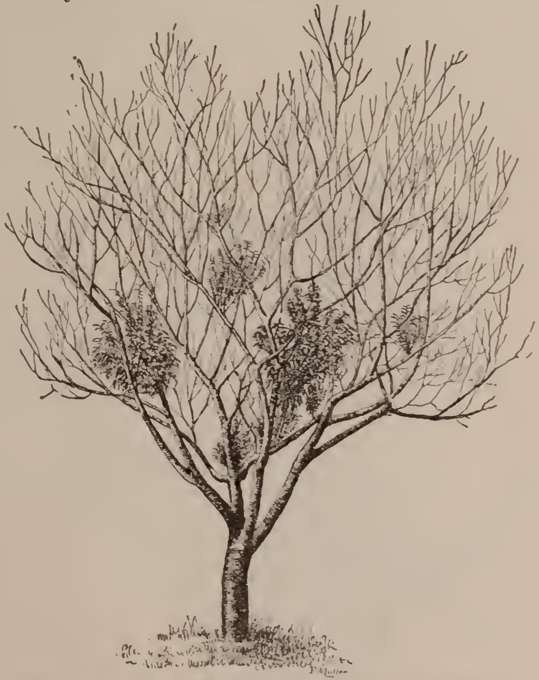

Fig. 6.—Yellows the fourth year (after Smith).

So far as our present knowledge of yellows goes, we have no satisfactory remedy for combatting it successfully. The only method of any consequence, is to uproot and burn the trees as soon as they show the first indication of this dreaded disease. Where orchardists and fruit growers have adopted the uprooting and burning plan, where there was the least suspicion that the trees were not healthy, there has been little complaint from the effects of the disease. This malady cannot be suppressed unless there is an organized and concerted warfare made against it all over the State. Every orchardist or fruit grower should make a thorough examination of his trees each season and satisfy himself conclusively that not a symptom of this disease and not a trace of the San Jose scale exists on his premises. If such a course is adopted by every one interested these pests can be successfully handled.

PEACH ROSETTE.

We have here to deal with a disease of the peach that does not occur in this State so far as we know. It is limited in its distribution to a few localities in Georgia, South Carolina, Arkansas and possibly other places. It is of great consequence to every nurseryman and fruit grower that he should be forewarned of his liability of serious annoyance and heavy loss by this dangerous disease, and forearmed with information as to the signs of its presence and the characteristics by which it may be unmistakably recognized.

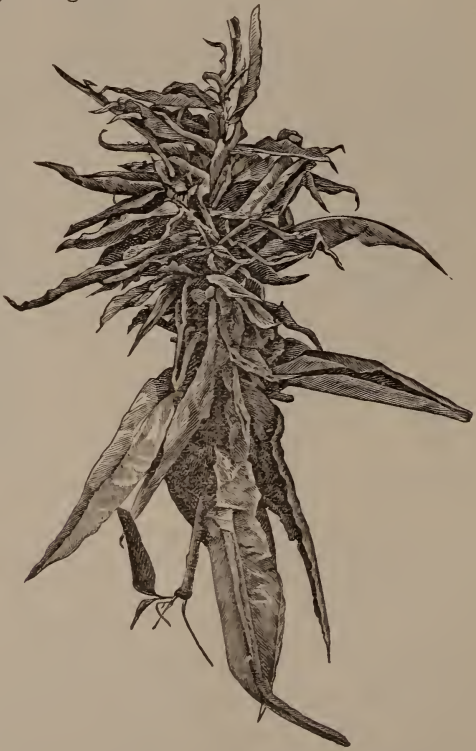

Fig. 7.—A single rosette (after Smith).

Rosette clearly belongs to the same type of disease as yellows. Its progress, however, is much more rapid and the first stages very much more striking. The leaf buds grow into compact tufts or rosettes, as shown in the illustration at Fig. 7. The prevailing color of the leaves is yellowish green or olivaceous, and the compact bunching is very conspicuous and makes the trees look quite unlike those attacked by yellows. The fruit is not matured on trees that are attacked in all parts. Rosette is quite unlike yellows in that there is no premature, red-spotted fruit, and that the severity of the disease is very much more rapid in its progress of destruction. Trees attacked with it very rarely survive longer than a year. It is easily communicated by budding or by root-grafting. The condition of a tree less than a year after inoculation is shown in the accompanying illustration (Fig. 8).

Some months are required for the virus of this disease to penetrate all parts of a tree, but the external symptoms show shortly after inoculation. Other methods of spread certainly exist, but, like yellows little or nothing is known concerning them.

Nothing definite is known as to the cause of the disease; but when it appears no time should be lost in digging out and destroying the trees. The affected stock should be destroyed early in the spring, as the leaves fall readily in midsummer and are a possible means of distributing the disease.

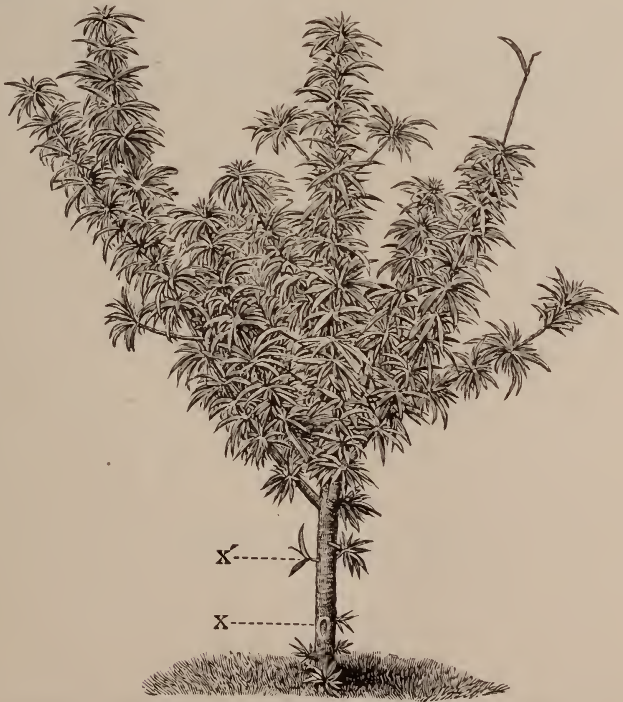

Fig. 8.—Rosette induced in a seedling by inoculation (after Smith).

We have conclusive evidence that this disease is virulently contagious, and, as in the case of yellows, it is a subject that should receive the most careful consideration on the part of every nurseryman and fruit grower within our State. Nurserymen, especially, should be very careful of buds from districts known to be infested by the rosette.

If at any time trees or nursery stock are found that present characteristics suggestive of this contagion, the fact should be reported to this office at once and the matter will receive immediate attention.

Persons residing within this State are requested to send specimens of plants injured by insects or disease to this office for identification whenever information is wanted regarding them. In sending insects for determination, especially larvae or worms, a small quantity of the food plant upon which they were found feeding should accompany the specimens. Such material, as a rule, enclosed in a small tin, wooden, or even a pasteboard box will stand transportation through the mail in good condition. In sending plants for determination, the leaf, flower and root should be represented when it is practicable to supply them. Any query regarding insects, fungous or bacterial diseases of plants will be most cheerfully answered.

Through the kindness of Dr. L. O. Howard, United States Entomologist, and Dr. B. T. Galloway, Chief of the Division of Vegetable Physiology and Pathology, all the cuts, except Figs. 1 and 2, used in this bulletin were obtained from the U. S. Dept. of Agriculture. Figures 3 and 4 are by L. O. Howard and C. L. Marlatt (Bul. 3, New Series, Div. Entom., on the San Jose Scale) and 5, 6, 7 and 8 by Erwin F. Smith (Farmers' Bul. 17, on Peach Yellows and Peach Rosette). The negatives from which Figs. 1 and 2 were reproduced were loaned me by Dr. A. F. Woods, Assistant Chief of the Division of Vegetable Physiology and Pathology of the U. S. Dept. of Agriculture.

MARYLAND

Agricultural Experiment Station.

BULLETIN NO. 43.

Report Upon the Value of a New Corn Product.

COLLEGE PARK, MD.

DECEMBER, 1896.

MARYLAND
Agricultural Experiment Station.

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Correspondents will please notify the Director of changes in their post-office address, or any failure to receive the bulletins.

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MARYLAND AGRICULTURAL EXPERIMENT STATION,

COLLEGE PARK, MD.

EXPERIMENTS CONDUCTED TO TEST THE VALUE OF A NEW CORN PRODUCT AS STOCK FOOD.

By H. J. Patterson, B. S., Chemist.

SUMMARY OF ESSENTIAL RESULTS.

1.—The new corn product contains 11 pounds per hundred more total digestible matter and 2 pounds per hundred more digestible protein than the whole fodder shredded.

2.—The new corn product contains as much digestible matter per hundred as corn blades.

3.—The new corn product contains 3 pounds per hundred more total digestible matter and one-half pound per hundred more digestible protein than timothy hay.

4.—The new corn product contained within one pound as much total digestible matter as wheat bran, but less than one-third as much digestible protein; consequently the nutritive ratio is wider.

5.—There was more digestible matter in a fattening ration with the new corn product as a base than when the same grain mixture was fed with corn blades.

6.—Animals fed with a fattening ration with the new corn product base made more gain in live weight and upon less feed than with a fattening ration of the same grain and corn blades.

7.—Rations made up with the new corn product can be fed with less labor and less waste of feed than when hay and fodder are fed separately as ordinarily practiced.

8.—The keeping qualities of the new corn product are as good as linseed meal, cotton seed meal or wheat bran.

REPORT UPON THE RESULTS OF AN INVESTIGATION CONDUCTED TO DETERMINE THE VALUE OF A NEW CORN PRODUCT FOR USE AS STOCK FOOD.

By H. J. Patterson, B. S. Chemist.

Prominent among the recent discoveries which will be beneficial to agricultural interests, as well as those more directly concerned, is the use of the pith of the corn stalk in the arts and in the construction of war vessels. Corn pith has properties which for many purposes makes it superior to any other substance known. One of the prominent uses to which it is put depends upon its ability to absorb great quantities of water very quickly.

In war vessels its chief use is for a packing between the inner and outer shells. This packing is put in under pressure and if pierced by a projectile it has the property of absorbing water and swelling with such rapidity as to close the hole before water can enter the vessel.

The naval department of the U. S. Government has conducted extensive experiments with corn pith for use in vessels, and the results have been so satisfactory that it has been adopted and specified for use in the construction of all new vessels. A number of European nations, also, have adopted it and others have commissions for the investigation of the material looking to its adoption.

This extensive use of corn pith means a market for a farm product which has been almost entirely wasted heretofore.

DESCRIPTION OF THE NEW CORN PRODUCT.

Field cured corn-fodder, after having the ear removed contains about one pound of pith to every fourteen or fifteen pounds of blades, husk, and stalk.

In the process of the extraction of the pith, the blades and husk are first removed and the stalks are cut up in small pieces. After the extraction of the pith from the stalk the balance is ground up into meal, which in general appearance resembles coarse bran, dried malt sprouts, or brewer's grain. This ground material is termed the "New corn product" and is the material which has formed the basis for the investigation, the results of which are given in the following pages.

Considering the fact that these products form so large a proportion of the fodder it is important to know the value of them in order that farmers may get as great a return as possible for their crop.

KIND OF EXPERIMENTS.

The experiments conducted in connection with the investigation of the value of the new corn product were of two general kinds:—Digestion experiments and the determination of the quantity and quality of the product as resulting from different kinds of feeding.

These experiments consisted in a comparison of the new corn product with corn fodder when prepared and fed in the most approved manner, and also comparison of the results with compounding different rations from these feeds.

LIST OF TESTS MADE.

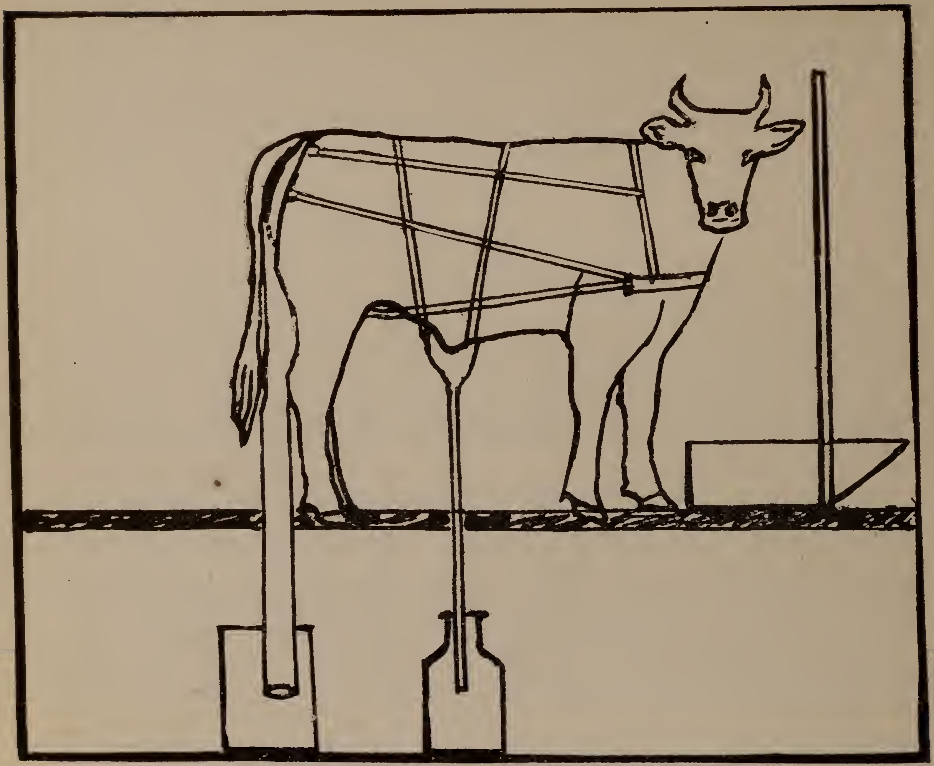
The following are the experiments conducted and treated of in this bulletin:

I. Comparison of the digestibility of the new corn product with that of shredded corn fodder.
II. Comparison of the digestibility of the new corn product and corn fodder ground fine like the new corn product.
III. Comparison of the digestibility of the new corn product fed wet and fed steamed.
IV. Comparison of the digestibility of the new corn product and corn blades.
V. Comparison of the digestibility of the new corn product and wheat bran.
VI. Comparison of the digestibility of the new corn product with a ration of equal parts of shredded corn fodder and wheat bran.
VII. Comparison of the digestibility of fattening rations—new corn product base vs. corn blades base.
VIII. The use of the new corn product for producing fat.

METHODS AND APPARATUS USED.

In the digestion experiments the dung and urine were collected and samples drawn from each for analysis. The sample were drawn daily and dried to the air dry state. The size of the samples were in proportion to the total amount of excreta. Composit samples were made from the daily samples for each steer for each period.

The animals were kept in a box stall which was well ventilated and lighted, yet out of sight of any food except that which was being fed, and they were kept perfectly quiet and normal at all times. The steers could lie down and get up naturally and with perfect ease and they chewed their cud naturally in all cases except when fed wheat bran alone. The animals had a bed composed of a mattress made by placing 2 or 3 inches of "excelsior" on the floor, and stretching and nailing a couple of thicknesses of "burlap" over it. This gave a comfortable bed yet one from which they would get nothing to eat. The stall and harness used for collecting the dung and urine is substantially that as devised by Dr. H. P. Armsby and shown by the following illustration:



APPARATUS FOR COLLECTING DUNG AND URINE.

ANIMALS USED.

The animals used in the digestion and fattening experiments were steers of good breeding—showing a good percentage of Short-horn blood. They were three years old, had good appetites, were always very easy to handle—at no time showing any discomfort or uneasiness, and on the whole proved to be exceedingly well adapted to the work for which they were used.

FEED USED.

New Corn Product.—This is the material described on page 166 and was made from fodder grown in Kentucky where the factory for the extraction of pith is located.

Ground Corn Fodder.—This was prepared from the same fodder as used in making the new corn product and contained the whole plant less the ear.

Shredded Corn Fodder.—This was fodder grown on the Experiment Station farm and was prepared by the "Tornado" fodder cutter and shredder. This fodder represented the entire plant less the ear.

Wheat Bran.—This was medium fine Western wheat bran.

The other feeds used in the fattening rations were Hominy Chop, Linseed Meal, and Cotton Seed Meal, which were bought in the open market, were of good quality and of about average composition.

The following table gives the composition of the feeds used:

TABLE I.—COMPOSITION OF FEEDS USED IN THE FOLLOWING EXPERIMENTS.

Index No.	DESCRIPTION OF SAMPLE.	Water.	Ash.	Protein.	Crude fiber.	N-free extract.	Fat.
		Per Ct	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.
1812	The New Corn Product........	9.22	4.00	6.38	28.70	48.86	2.84
1887	Finely Ground Corn Fodder..	9.80	4.50	3.94	33.18	46.16	2.42
1747	Shredded Corn Fodder........	20.10	4.60	4.31	28.29	40.33	2.37
1811	Fodder Blades....	8.92	6.70	6.56	29.96	45.61	2.25
1751	Cotton Seed Meal.....	8.03	7.45	39.38	5.27	27.17	12.70
1752	Linseed Meal	5.88	4.69	33.98	8.20	34.29	7.96
1753	Wheat Bran, (Western)	13.26	5.24	17.77	9.51	48.22	6.00
1754	Wheat Bran............	14.71	5.54	14.60	9.10	50.64	5.41
1749	Hominy Chop....	16.00	2.31	9.35	3.91	59.74	8.69
....	Ration "K"......................	10.71	4.57	10.32	23.71	46.68	4.01
....	Ration "L" Fodder and Grain.	10.28	5.93	11.94	21.26	46.15	4.44
....	Ration "L" Grain Mixture ...	12.56	4.64	21.04	6.58	47.04	8.14

TABLE II.—COMPOSITION OF DUNGS COLLECTED IN DIGESTION EXPERIMENTS.

Index No.	DESCRIPTION OF SAMPLE.	Water.	Ash.	Protein	Crude fiber	N-free extract	Fat.
		Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.
1760	Steer 3—Fed Shredded Fodder	83.56	1.50	1.21	4.80	8.62	0.31
1761	" 4— " " "	84.40	1.54	1.19	4.48	8.09	0.30
1768	" 1— " " "	85.16	1.46	1.26	4.27	7.57	0.28
1769	" 2— " " "	84.83	1.60	1.34	3.90	8.03	0.30
1796	" 3—Fed Fodder and Bran	82.14	1.95	1.83	4.43	8.58	1.07
1797	" 4— " " " "	83.37	1.66	1.50	4.47	8.52	0.48
1806	" 1— " " " "	80.36	2.07	1.94	5.50	9.25	0.88
1807	" 2— " " " "	82.46	2.11	1.57	5.00	8.18	0.68
1818	" 3—Fed Wheat Bran	83.85	1.78	1.78	3.79	6.78	2.02
1819	" 4— " " "	80.13	1.71	2.21	5.30	9.29	1.36
1830	" 1— " Fodder Blades...	80.27	3.33	1.99	4.76	8.94	0.71
1831	" 2— " " " ...	81.71	2.57	1.95	4.42	8.87	0.48
1840	" 3— " " " ...	84.66	2.40	1.51	4.22	6.83	0.38
1841	" 4— " " " ...	85.51	2.37	1.60	3.22	6.89	0.41
1855	" 1— " N. C. Product....	83.41	1.07	1.35	5.68	8.24	0.25
1865	" 3— " " " ...	85.35	0.80	1.16	5.02	7.46	0.21
1866	" 4— " " " ...	86.52	0.89	0.99	4.57	6.83	0.20
1875	" 1— " " P. Steamed	83.03	0.81	0.99	6.98	7.99	0.20
1876	" 2— " " "	82.95	0.91	1.09	5.75	9.11	0.19
1884	" 3 - " " "	84.99	0.73	1.06	5.58	7.46	0.18
1895	" 3— " Finely Ground Fodder	84.95	1.23	0.97	5.24	7.41	0.20
1896	" 4— " Finely Ground Fodder..........	82.59	1.30	1.00	6.00	8.89	0.22
1945	" 1— " Ration "K".......	84.86	1.06	1.13	5.40	7.30	0.25
1946	" 2— " " "K"......	83.96	1.06	1.24	5.59	7.88	0.27
1958	" 3— " " "L".......	85.12	2.16	1.64	3.86	6.77	0.45
1959	" 4— " " "L"......	83.01	2.40	1.93	4.17	8.06	0.43

I. COMPARATIVE DIGESTIBILIPY OF THE NEW CORN PRODUCT AND SHREDDED CORN.

During the past few years, there has been considerable done in the way of testing methods for preparing corn fodder for feeding with most of the results in favor of some method of shredding the stalk. Shredding possesses many points which makes it superior to the ordinary or old way of cutting fodder; the principal one of which is that the shredded fodder is almost wholly eaten by animals; this is due largely to the absence of the whole section of the cut stalk and stalk nodes with their sharp cutting edges. The absence of these hard cutting edges prevent the mouths of the animal from becoming sore. Again the portion refused makes better bedding for the animals, being softer and having greater absorptive powers, and it will also decompose more readily and make better manure. Consequently in determining the value of the new corn product it was decided to compare it first with fodder of the whole plant prepared in the most approved manner.

The results are given in Table III and IV which follow. These results are computed from the amounts eaten and excreted in connnection with the composition of the foods and dungs as given in tables I and II.

TABLE III. DIGESTIBILITY OF THE COMPONENTS OF THE NEW CORN PRODUCT.—FED WET.

Duration of Preliminary Period 10 Days. Digestion Period 7 Days.
(*In grams, 453.6 grams=1 pound.*)

	Fresh substance.	Dry substance.	Ash.	Protein.	Crude fiber.	N-free extract.	Fat.
	Grams.	Grams	Grams.	Grams.	Grams.	Grams.	Grams.
STEER 1							
Food eaten (1812)....	35000	31772	1400	2233	10045	17100	994
Total excreted (1855)	71170	11806	761	961	4043	5864	177
Digested.............		19966	639	1272	6002	11236	817
Per cent digested ...		62.84	45.64	57 22	59.75	65.71	82.19
STEER 3							
Food eaten (1812)....	42000	38130	1680	2680	12055	20520	1195
Total excreted (1865).	94810	13890	758	1100	4758	7075	199
Digested.............		24240	922	1580	7297	13445	996
Per cent digested ...		63.57	54.88	59 55	60.53	65.52	83.35
STEER 4.							
Food eaten (1812)...	35000	31772	1400	2233	10045	17100	994
Total excreted (1866)	84800	11430	755	839	3875	5791	170
Digested............		20342	645	1894	6170	11309	824
Per cent digested....		64.02	46.07	62 26	61.42	66 13	82 89
Average for 3 steers.		63 48	48 86	59.68	60 57	65.79	82 81

TABLE IV.—DIGESTIBILITY OF THE COMPONENTS OF SHREDDED FODDER.

Duration of Preliminary Feeding 12 days. Duration of Digestion period 6 days.

	Fresh substance.	Dry substance.	Ash.	Protein.	Crude-fiber.	N-free Extract	Fat.
STEER 1.—Fed wet	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.
Food eaten (1747)...	28960	23137	1332	1248	8191	11680	686
Total excreted (1768).	59560	8838	870	750	2543	4508	167
Digested.............		14299	462	498	5648	7172	519
Per cent. digested....		61.84	34.68	39.90	68.95	61.40	75.66
STEER 2.—Fed wet.							
Food eaten (1747) ...	29840	23840	1373	1286	8442	12032	707
Total excreted (1769).	64300	9752	1028	861	2507	5163	193
Digested.............		14088	345	425	5935	6869	514
Per cent. digested....		59.09	25.13	33.05	70.30	57.09	72.70
Average for 2 steers fed wet..............		60.46	29.90	36.48	69.64	59.22	74.18
STEER 3.—Fed dry.							
Food eaten (1747)....	30510	24375	1403	1315	8630	12304	723
Total excreted (1760).	63240	10390	948	765	3085	5446	196
Digested............	13985	13985	455	550	5595	6858	527
Per cent. digested....		57.37	32.44	41.82	64 83	55.67	72 89
STEER 4.—Fed dry.							
Food eaten (1747)....	30740	24560	1414	1325	8677	12415	729
Total excreted (1761).	69050	10770	1063	821	3096	5583	207
Digested.............		13790	351	504	5581	6832	522
Per cent. digested....		56.14	24.82	37.96	64.32	55.03	71 60
Average for 2 steers fed dry..............		56.75	28.63	39.89	64.57	55 35	72.24
Average for 4 steers.		58.6	29.3	38.2	67.1	57.3	73 2

Bringing the above results together for comparison we have.

TABLE V. PERCENTS DIGESTIBLE.

	Dry substance.	Ash.	Protein.	Crude fiber.	N-free extract.	Fat.
New corn product....	63.5	48.7	59.7	60.5	65.8	82.8
Shredded corn fodder.	58.6	29.3	38.2	67.1	57.3	73.2
Dif. in favor of n. c. p.	4.9	19.4	21.5		8.5	9.6

Taking these coefficients of digestibility in connection with the composition of the feeds as given in table I, we have the following:

TABLE VI. POUNDS OF DIGESTIBLE MATTER IN 100 POUNDS OF THE FEED.

	Dry substance.	Ash.	Protein.	Crude fibre.	N-Free extract.	Fat.
New corn product....	57.6	1.9	3.8	17.3	32.2	2.4
Shredded corn fodder.	46.8	1.3	1.6	19.0	23.2	1.7
Dif. in favor of n. c. p.	10.8	0.6	2.2		9.0	0.7

From these results we have a nutritive ration for

The new corn product of 1 : 14.4
Shredded corn fodder of 1 : 28.7

DISCUSSION OF RESULTS.

The results given in the above tables proves the new corn product to be a valuable cattle food, and in no sense should it be considered a waste product. The results not only show this material to be valuable, but in every respect show it to be superior to the shredded corn fodder or the entire plant in its natural condition.

Why these results should be so is not proven conclusively by the above figures, but they indicate very strongly both from a comparison of the composition and digestibilities that the pith which is poor in food components, (and makes up the greater part of the plant by bulk, and yet only one fifteenth part of it by weight) and also has the capacity to absorb fifteen times its weight of water exerts this ability when it is taken into the mouth and stomach and takes unto itself an undue proportion of the digestive fluids, which leaves an insufficient quantity to act upon the portions of the plant which are richest in food constituents. Consequently the richer parts of the food pass the stomach incompletely digested.

In these experiments it will be noted that the daily consumption per steer was practically the same with the two kinds of food, so the difference in digestibility cannot be attributed to any difference in this respect.

The dislike which animals show for cut fodder in many instances and the less waste incurred by feeding the fodder wet (see bulletin 41 of this Station) is no doubt in a large measure due to the absorptive properties of the pith.

The lower digestive coefficients and nutritive ratio obtained with the shredded fodder in this experiment, and those reported in bulletins Nos. 20 and 41 of this Station as compared with those obtained with fodder grown for the North can be attributed to the fact that Southern fodder is much larger than the Northern varieties and contains a much larger proportion of the pith; or, in other words, there is a much greater bulk of the portion poor in food constituents as compared to the portion richest in food compounds in the Southern than in the Northern varieties of corn.

The lower percentage of digestible crude fiber as obtained in the new corn product as compared with the shredded corn fodder can be attributed to the fact that the fiber portion of the plant in this product is harder and of more woody nature than the average of the entire plant.

II. COMPARATIVE DIGESTIBILITY OF THE NEW CORN PRODUCT AND CORN FODDER FINELY GROUND LIKE THE NEW CORN PRODUCT.

In order to test if the higher digestibility of the new corn product over shredded corn fodder was due to the mechanical condition of the former; some of the fodder from which the new corn product was made was reduced to the same mechanical condition. The entire plant was finely ground so that it represented practically the same material as the shredded fodder and also served to compare the fodder grown on the Experiment Station farm with that used in making the new corn product.

The following table gives the digestibility of finely ground corn fodder:

TABLE VII.—DIGESTIBILITY OF FINELY GROUND CORN FODDER. (ENTIRE PLANT.)

Duration of Preliminary Feeding 6 Days.—Digestion Period 7 Days.

	Fresh substance.	Dry substance.	Ash.	Protein	Crude fiber.	N-free extract.	Fat.
	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.	Grams.
STEER 3.							
Food eaten (1887)....	42000	37881	1890	1655	13935	19385	1016
Total excreted (1895).	107170	16126	1318	1039	5615	7940	214
Digested............		21755	572	616	8320	11445	802
Per cent digested.....		57.43	30.26	37.22	59.75	59.04	78.94
STEER 4.							
Food eaten (1887)....	21000	18940	945	828	6967	9692	508
Total excreted (1896).	55600	9680	723	556	3336	4943	122
Digested............		9260	222	272	3631	4749	386
Per cent digested..		48.89	23 49	32.85	52.12	49.00	75.98
		53.16	26.88	35.04	55.94	54 02	77.46

Bring the results as given in table V together with those of table VII we have

TABLE VIII. PERCENTS DIGESTIBLE.

	Dry substance.	Ash.	Protein.	Crude fiber.	N-free extract.	Fat.
New corn product....	63.5	48.7	59.7	60.5	65.8	82.8
Shredded corn fodder.	58.6	29.3	38.2	67.1	57.3	73.2
Finely grn'd corn fod'r	53.2	26.9	35.0	55.9	54.0	77.5

TABLE IX. POUNDS OF DIGESTIBLE MATTER IN 100 POUNDS.

	Dry substance.	Ash.	Protein.	Crude fiber.	N-free extract.	Fat.	Nutritive ratio.
New corn product.....	57.6	1.9	3.8	17.3	32.2	2.4	1:14.4
Shredded corn fodder..	46.8	1.3	1.6	19.0	23.2	1.7	1:28.7
Ground corn fodder....	48.2	1.3	1.4	18.7	24.9	1.9	1:34.1

From the results as given in tables VIII and IX it is seen that there is very little difference between the shredded and finely ground corn fodder, though by a reference to the table showing the composition of these feeds it will be seen that the finely ground fodder was not quite as good as the shredded fodder; so that these results are really slightly in favor of the fine division of the fodder, but on the whole there is about the same difference in favor of the new corn product over ground corn fodder as over shredded corn fodder. Consequently the value of the new corn product cannot be attributed wholly or to any great degree to its mechanical condition.

III. COMPARATIVE DIGESTIBILITY OF THE NEW CORN PRODUCT FED WET AND FED STEAMED.

It is a question of considerable interest to many farmers to know the effect of steaming upon hays and fodder, and as it was desirable to know the effect upon this product the steers were fed for one period upon steamed food. One steer ate very well at first but got off his feed and could not be used during the digestion period. The steaming was done by placing the wet fodder in a barrel, covering it, and running live steam into the mass for 15 minutes, then cooling sufficiently before giving it to the animals.

The results are given in tables X and XI.

TABLE X.—DIGESTIBILITY OF THE NEW CORN PRODUCT STEAMED.

Duration of Preliminary Period 8 Days. Digestion Period 7 Days.

	Fresh substance.	Dry substance.	Ash.	Protein.	Crude fiber.	N-free extract.	Fat.
Steer 1.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Food eaten (1812).......	41000	37210	1640	2615	11765	20030	1160
Total excreted (1875)....	106560	18080	863	1055	7436	8513	213
Digested	....	19130	777	1560	4329	11517	947
Per cent. digested	....	51 44	47.38	59.65	36.79	57 44	70.34
Steer 2.							
Food Eaten	34000	30860	1360	2169	9756	16610	965
Total excreted (1876)...	78530	13388	714	856	4515	7154	149
Digested	....	17472	646	1313	5241	9456	816
Per cent. digested......	......	56.61	47.50	60.53	53 72	56.93	84 56
Steer 3.							
Food Eaten.............	42000	38130	1680	2680	12055	20520	1195
Total excreted (1884)...	103070	15468	752	1092	5751	7688	185
Digested	.....	22662	928	1588	6304	12832	1010
Per cent. digested.......	....	59.43	55.24	59.25	52.29	62.53	84.52
Average for 3 steers.....	....	55.83	50.04	59.81	47.60	58.97	79.81

TABLE XI.—PERCENTS DIGESTIBLE.

	Dry substance.	Ash.	Protein	Crude fiber.	N-free extract.	Fat.
New corn product-wet......	63.5	48.7	59.7	60.5	65.8	82.8
New corn product-steamed..	55.8	50.0	59.8	47.6	58.9	79.8

From these results the conclusion is drawn that steaming the fodder has not only no advantage, but is a disadvantage considering the amount which is digestible and necessitates extra time and expense in steaming. The animals did not seem to relish the steamed food any better than that which was simply wet; nor did they eat any more of it.

VI. COMPARISON OF THE DIGESTIBILITY OF THE NEW CORN PRODUCT WITH THAT OF CORN BLADES OR LEAVES.

To make this record more complete digestion experiments were conducted with the corn blades and husks which are taken off and separated from the other parts in the process of the pith extraction.

The composition of this mixture of blades and husk is given in table I.

The digestion coefficients and data from which they are obtained are given in table XII.

TABLE XII.—DIGESTIBILITY OF THE FOOD COMPOUNDS OF CORN BLADES AND SHUCKS.

Duration of Preliminary Period 8 Days. Duration of Digestion Period 7 Days.

	Fresh substance.	Dry substance	Ash.	Protein.	Crude fiber.	N-free extract.	Fat.
Steer 1.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Food eaten (1811).......	32000	29145	2144	2099	9587	14595	720
Total excreted (1830)...	47900	9450	1595	953	2280	4282	340
Digested................	....	19695	549	1146	7307	10313	380
Per cent. digested.......	....	67.58	25.61	54.60	76.01	70.66	52.78
Steer 2.							
Food eaten (1811).......	40000	36435	2680	2624	11985	18246	900
Total excreted (1831)...	68150	12463	1751	1329	3012	6044	327
Digested................	....	23972	929	1295	8973	12202	573
Per cent. digested.......	....	65.79	34.66	49.35	74.87	66.88	63.67
Steer 3.							
Food eaten (1811).......	48000	43713	3215	3148	14380	21890	1080
Total excreted (1840)...	113370	17390	2720	1712	4784	7742	432
Digested................	....	26323	495	1436	9596	14148	648
Per cent. digested.......	....	60.22	15.40	45.62	66.73	6463	60.00
Steer 4.							
Food Eaten (1811).......	40000	36435	2680	2624	11985	18246	900
Total excreted (1841) ..	96440	13975	2286	1543	3105	6647	395
Digested................	....	22460	394	1081	8880	11599	505
Per cent. digested......	....	61.64	14.70	41.19	74.09	63.57	56.11
Average for 4 steers....	.....	64.56	22.59	47.69	72.93	66.44	58.14

From the data above and that in the preceding tables together with the average American digestive coefficients for timothy hay, we have tables XIII and XIV.

TABLE XIII.—PERCENTS DIGESTIBLE.

	Dry substance.	Ash.	Protein.	Crude fiber.	N-free extract.	Fat.
New corn product.........	63.5	48.7	59.7	60.5	65.8	82.8
Corn blades and shucks.....	64.6	22.6	47.7	72.9	66.4	58.1
Timothy hay (Maine)......	59.1	39.7	47.5	54.8	64.7	69.8

TABLE XIV.—POUNDS OF DIGESTIBLE MATTER IN 100 POUNDS.

	Dry substance.	Ash.	Protein.	Crude fiber.	N-free extract.	Fat.	Nutritive ratio.
New corn product	57.6	1.9	3.8	17.3	32.2	2.4	1:14.4
Corn bl'des & sh'ks	58.8	1.5	3.1	21.8	30.3	1.3	1:17.7
Timothy hay	54.6	1.9	3.2	16.6	30.0	2.9	1:16.6

From the results given in the above tables it will be seen that there is not a very great difference in the amount of digestible matter in these three foods, the difference being slightly in favor of the new corn product, and the timothy hay ranking ahead of the blades when the most essential food components are considered.

V. COMPARATIVE DIGESTIBILITY OF THE NEW CORN PRODUCT AND WHEAT BRAN.

As this corn product in a sense is a milling product and bears the same relation to the corn stalk as the bran of wheat does to the whole grain, it was thought desirable to compare their digestibilities so that readers might have data at hand for a comparison and at the same time to show clearly that there is a difference between these feeds and that the new corn product and wheat bran belong to different classes and in no manner could one be used to replace the other in the preparation of rations.

The following table gives the data from which the digestibility of the wheat bran is determined:

TABLE XV. DIGESTIBILITY OF WESTERN WHEAT BRAN.

Duration of Preliminary Feeding 6 Days.—Duration of Digestion Period 6 Days.

	Fresh substance.	Dry substance.	Ash.	Protein.	Crude fiber.	N-free extract.	Fat.
STEER 3.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Food eaten (1753)	36000	31225	1886	6398	3424	17357	2160
Total excreted (1818)	61240	9890	1090	1090	2321	4152	1237
Digested	....	21335	796	5308	1103	13205	923
Per cent digested	....	68.33	42 21	82.96	32.21	76.08	42.73
STEER 4.							
Food eaten (1753)	30000	26020	1572	5330	2853	14465	1800
Total excreted (1 819)	44130	8768	754	975	2340	4099	600
Digested	....	17252	818	4355	513	10366	1200
Per cent digested	....	66 30	52.04	81.71	17.98	73 05	66.67
Average for 2 steers		67.32	47.13	82.33	25.10	74.57	54.70

These figures together with those given in preceding sections give us the following:

TABLE XVI. PERCENTS DIGESTIBLE.

	Dry substance.	Ash.	Protein.	Crude fiber.	N-free extract.	Fat.
New corn product....	63.5	48.7	59.7	60.5	65.8	82.8
Wheat bran..........	67.3	47.1	82.3	25.1	74.6	54.7

TABLE XVII.—POUNDS OF DIGESTIBLE MATTER IN 100 POUNDS OF THE FEED.

	Dry substance.	Ash.	Protein.	Crude fiber.	N-free extract.	Fat.	Nutritive ration.
New corn product.	57.6	1.9	3.8	17.3	32.2	2.4	1:14.4
Wheat bran.......	58.6	2.4	14.6	2.4	35.9	3.3	1: 3.1

The above results show the wheat bran to contain one pound per hundred more digestible matter than the new corn product and the principal difference in the two to be in the relatively larger amount of digestible protein in the wheat bran. This higher amount of digestible protein coupled with a corresponding decreased quantity of digestible carbohydrates makes the foods have a very different nutritive ratio and causes the wheat bran to have a higher food value as the protein is the most expensive food constituents. The wheat bran belongs to the general class of nitrogenous foods and the corn product to the carbonaceous class and consequently must not be used as substitutes for one another or used in the same manner. The corn product can be used alone for feeding cattle and maintain them in fair and nearly normal condition, but wheat bran could not be used in a similar manner.

VI. COMPARISON OF THE DIGESTIBILITY OF THE NEW CORN PRODUCT WITH A RATION OF EQUAL PARTS OF SHREDDED FODDER AND WHEAT BRAN.

A ration made up by feeding equal amounts, by weight, of corn fodder and wheat bran gives (using the average American analyses and digestive coefficients) a nearly standard ration for milch cows. To test if such a combination would prove to be as digestible in practice as in theory and to compare it with this new corn product both separately and in the combination as given in subsequent pages, it was deemed desirable to make the test indicated.

The shredded fodder and wheat bran used in the test when mixed in equal quantities gave a ration of the following composition:

Water	16.68	per cent.
Ash	4.92	"
Protein	11.04	"
Crude fiber	18.90	"
N.-free extract	44.28	"
Fat	4.18	"
	100.00	

By using the digestion coefficients obtained for this fodder and bran as given in the preceding tables we obtain for the above ration a nutritive ratio of 1:5.65.

The following table gives the results of the digestive experiments with the ration:

TABLE XVIII.—DIGESTIBILITY OF A RATION OF EQUAL PARTS OF SHREDDED CORN FODDER AND WHEAT BRAN FED WET AS MIXED FEED.

Duration of Preliminary Feeding 7 Days. Duration of Digestion Period 6 Days.

	Fresh substance.	Dry substance.	Ash.	Protein.	Crude fiber.	N-free extract.	Fat.
Steer 1.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Fodder eaten (1747).....	20830	16642	958	808	5893	8398	493
Grain eaten (1753).......	24000	20817	1258	4265	2282	11572	1440
Total eaten.............	44830	37459	2216	5163	8175	19970	1933
Total excreted (1806)....	71670	14075	1483	1390	3944	6628	630
Digested................	....	23384	733	3773	4231	13342	1303
Per cent. digested.......	....	62.43	33 08	73.08	51.76	66.81	67.41
Steer 2.							
Fodder eaten (1747).....	24000	19175	1104	1034	6790	9678	569
Grain eaten (1753).......	24000	20817	1258	4265	2282	11572	1440
Total eaten	48000	39992	2362	5299	9072	21250	2009
Total excreted (1807)....	83360	14620	1759	1309	4168	6817	567
Digested................	....	25372	603	3990	4904	14433	1442
Per cent digested......	....	63.44	25.53	75.29	54.06	67.92	71.78
Steer 3.							
Fodder eaten (1747).....	21000	16779	966	905	5940	8470	498
Grain eaten (1753).......	21000	18215	1105	3732	1997	10121	1260
Total eaten........	42000	34994	2071	4637	7937	18591	1758
Total excreted (1796)....	75930	13561	1480	1389	3366	6514	812
Digested................	....	21433	591	3248	4571	12077	946
Per cent. digested.......	....	61.25	28.54	70.05	57.59	64.96	53.24
Steer 4.							
Fodder eaten (1747)......	21000	16779	966	905	5940	8470	498
Grain eaten (1753).......	21000	18215	1105	3732	1997	10121	1260
Total eaten..............	42000	34994	2071	4637	7937	18591	1758
Total excreted (1797)....	72350	12031	1201	1085	3234	6164	347
Digested................	......	22963	870	3552	4703	12427	1411
Per cent. digested.......	....	65.62	42.01	76.60	59 25	66 84	80.26
Average for 4 steers.....	....	63.19	32.29	73.76	55.67	66.63	68.17

This data with that in previous tables gives the results in tables XIX and XX.

TABLE XIX. PERCENTS DIGESTIBLE.

	Dry substance.	Ash.	Protein.	Crude fiber.	N-free extract.	Fat.
New corn product	63.5	48.7	59.7	60 5	65.8	82.8
Ration of fodder & wheat bran	63.2	32.3	73.8	55.6	66.6	68.2

TABLE XX. POUNDS OF DIGESTIBLE MATTER IN 100 POUNDS OF THE FEED.

	Dry substance.	Ash.	Protein.	Crude fiber.	N-free extract.	Fat.	Nutritive ratio.
New corn product	57.6	1.9	3.8	17.3	32.2	2.4	1:14.4
Fodder-Bran ration	52.7	1.6	8.1	10.5	29.6	2.9	1:5.7

From the above results it will be seen that there is but little difference in the percentage of digestible dry substance in the corn product and the ration; but that there is five pounds per hundred more total digestible matter in one hundred pounds of the new corn product. The point of excellence of the ration over the corn product rests in it containing twice as much digestible protein. The nutritive ratio obtained by actual test for the ration is 1:5.74 which is very close to the theoretical obtained for the feeds when fed separately as given in previous tables (1:5.65.)

VII. COMPARISON OF THE DIGESTIBILITY OF FATTENING RATIONS WITH THE NEW CORN PRODUCT BASE AND CORN BLADES BASE.

In this portion of the work it was desired to determine the digestibility of a fattening ration of the new corn product base as compared with a fattening ration made up of the same grains and mixed in the same proportions, but feeding corn blades as long food and in the usual manner instead of the new corn product which was mixed uniformly with the grain.

The grain mixture contained hominy chop, wheat bran, cotton seed meal and linseed meal. In this experiment the food eaten during the digestion periods had the composition of Rations "K" and "L" as given in Table I page 169 from this data and the amounts eaten and excreted we have tables XXI and XXII.

TABLE XXII—DIGESTIBILITY OF THE COMPONENTS OF FATTENING RATION COMPOSED OF GRAIN MIXED WITH CORN BLADES.

Preliminary Period 18 Days. Digestion Period 6 Days.

	Fresh substance.	Dry substance.	Ash.	Protein.	Crude fiber..	N-free extract.	Fat.
Steer 3.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Fodder eaten (1811).....	47000	42803	3148	3083	14080	21435	1057
Grain eaten "L"	30000	26222	1392	6301	1974	14113	2442
Total eaten	77000	69025	4540	9384	16054	35548	3499
Total excreted (1958)....	202500	30180	4373	3321	7815	13760	911
Digested	....	38845	167	6063	8239	21788	2588
Per cent. digested.	....	56.28	3.68	64 61	51.32	61 29	73.96
Steer 4.							
Fodder eaten (1811)......	39000	35516	2613	2558	11683	17785	877
Grain eaten "L".......	21000	18361	974	4418	1382	9878	1709
Total eaten	60000	53877	3587	6976	13065	27663	2586
Total excreted (1959)....	125830	21375	3020	2428	5246	10140	541
Digested	....	32502	567	4548	7819	17523	2045
Per cent. digested......	......	60.33	15.81	65.19	59.84	63 34	79.08
Average for 2 steers....	....	58.31	9.75	64.90	55.58	62 32	76.52

TABLE XXI.—DIGESTIBILITY OF COMPONENTS OF FATTENING RATION COMPOSED OF GRAIN MIXED WITH THE NEW CORN PRODUCT.

Preliminary Period 10 Days. Digestion Period 7 Days.

	Fresh substance.	Dry substance.	Ash.	Protein.	Crude fiber	N free extract.	Fat.
Steer 1.	Grams	Grams	Grams	Grams	Grams	Grams	Grams
Food eaten "K"..	70000	62503	3199	7224	16597	32676	2807
Total excreted (1945)....	156910	23757	1663	1773	8474	11455	392
Digested	....	38746	1536	5451	8123	21221	2415
Per cent. digested.......	....	61.99	48.02	75.46	48.94	64.94	86.03
Steer 2.							
Food eaten "K"........	70000	62503	3199	7225	16597	32676	2807
Total excreted (1946)....	144280	22136	1529	1789	8064	11365	389
Digested	......	39367	1670	5435	8533	21311	2418
Per cent. digested.......	....	62.98	52.20	75.24	51.41	65.22	86.14
Average for 2 steers....	....	62.49	50.11	75.35	50 18	65.08	86.09

From the above tables we have the following digestion coefficients and amounts of digestible matter per hundred pounds of the ration:

TABLE XXIII. PERCENTS DIGESTIBLE.

	Dry substance.	Ash.	Protein.	Crude fiber.	N-free extract.	Fat.
Corn product-grain ration....	62.5	50.1	75.4	50.2	65.1	86.1
Corn blades-grain ration.....	58.3	9.8	64.9	55.6	62.3	76.5

TABLE XXIV. POUNDS OF DIGESTIBLE MATTER IN 100 POUNDS OF THE RATION.

	Dry substance.	Ash.	Protein.	Crude fiber.	N-free extract	Fat.	Nutritive ratio.
Corn product-grain ration..	55.8	2.3	7.8	11.9	30.4	3.5	1:6.4
Corn blades-grain ration...	52.4	0.6	7.7	11.8	28.8	3.4	1:6.2

Notwithstanding the fact that the corn fodder blades ration contained a higher percentage of protein than the other ration and about a corresponding percentage of the other constituents, there was much lower digestion coefficients for all the food compounds in the corn blades ration and also a smaller amount of digestible food per hundred pounds. These results in themselves are considerably in favor of the new corn product ration.

VII. FATTENING EXPERIMENTS.

As a further test and comparison of the efficiency of the fattening rations described in the preceding section the steers were fed for 60 days with the rations "K" and "L" respectively and a record of their weights kept for comparison.

The steers were weighed on Saturday and Monday of each week and the average of these two weights taken and considered as representing the weight of the steers on the Sunday intervening.

The steers had been fed on dry fodder during the four months preceding the time for fattening, and were used in the digestion experiments recorded in this bulletin. The amounts which they ate kept their stomachs well filled so that it is not probable any considerable portion of the grains should be attributed to the filling up and retention of food in the digestive canal.

The fattening was carried on during the months of June and July and it was expected to conduct the experiment further, but the exceedingly dry and hot weather together with the flies were not favorable to stall feeding of cattle in this climate. These unfavorable weather conditions were harder and more apparent upon the fatter steers; consequently, further stages of the work could not be considered reliable.

The following are the results of the fattening test:

TABLE XXV.—FOOD EATEN.

	Lot I—Ration "K." lbs.	Lot II—Ration "L." lbs.
During 1st 30 days	1371	1435
During 2nd 30 days	1521	1561
Total in 60 days	2892	2996

From the above results we see that the new corn product ration produced more grain on less food than the corn blades ration. The actual amount of food consumed by steers on ration "K" was less than by those on ration "L" and considerably less per hundred pounds of live weight of the animals.

TABLE XXVI.—GAIN MADE BY STEERS.

	Lot I—Ration "K." New Corn Product and Grain Mixture.		Lot II—Ration "L." Corn Blades and Grain Mixture.	
	Steer 1. lbs.	Steer 2. lbs.	Steer 3. lbs.	Steer 4. lbs.
Weight at beginning........	1125	1163	1097	940
Weight at end of 30 days...	1263	1350	1173	1110
Gain in 30 days..............	138	187	76	170
Average gain per day	4 3/5	6	2½	5⅔
Weight at end of 60 days....	1314	1402	1243	1199
Gain in 60 days.............	189	239	146	257
Total gain per lot...........	428		403	
Average daily gain per steer for 60 days....... ..	3.57		3.36	

CONCLUSIONS.

The results of all the tests made show the new corn product to be a valuable stock food. They show it to be richer in composition than the whole fodder and the food compounds more digestible. The new corn product contained more pounds of digestible food per hundred pounds of the original feed than does whole fodder, corn blades or timothy hay.

Rations compounded with the new corn product as a base are eaten well by cattle. These rations are more digestible than the same grains fed with fodder blades and will produce more grain in live weight per hundred pounds of food fed than the fodder blades ration. Such rations are more easily fed and there is less waste than in feeding in the ordinary manner.

This new corn product is in such a shape that it can be easily and uniformily mixed with any kind of ground grain or any of the by-product cattle foods so common on the market. By the use of this corn product as a base it is possible to mix a complete and normal ration for stock in one bulk and which can be fed at one feeding, so obviating the necessity of feeding grain and hay separately. This is a thing that has not been possible heretofore with any class of food products on our markets in the shape in which they existed. Rations mixed in this manner are as staple and possess as great keeping qualities as cotton seed meal or wheat bran. Animals fed upon such rations ate them with relish and kept in normal condition at all times. Cows and steers would lie down and chew their cud as naturally as when fed hay or in pasture.

MARYLAND

Agricultural Experiment Station.

BULLETIN NO. 44.

The Soils of the Hagerstown Valley.

COLLEGE PARK, MD.

DECEMBER, 1896.

MARYLAND

Agricultural Experiment Station.

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ADDRESS,

MARYLAND AGRICULTURAL EXPERIMENT STATION,
COLLEGE PARK, MD.

LETTER OF TRANSMITTAL.

Sir:—

I have the honor to send you herewith a bulletin by Mr. Clarence W. Dorsey on the Soils of the Hagerstown Valley. The work has been done under my direction and with the approval of the Secretary of Agriculture in the laboratory of the Division of Soils of the U. S. Department of Agriculture.

Respectfully,
MILTON WHITNEY,
Physicist.

Mr. ROBERT H. MILLER,
Director, Maryland Agricultural Experiment Station.

SUMMARY:

1.—As the soils of the State have been classified into a number of distinct types differing in origin and agricultural value, there is need of detailed study upon each of these types to determine the local variations which were not considered in the general classifaction.

2.—In the Hagerstown valley there are 3 principal rock formations which give rise to 5 distinct soil types, all differing in their relations to agriculture.

3.—The Cambrian sandstone soils derived from the decay of the whitish Cambrian sandstone, are shallow, stony soils which occupy a narrow strip along the base of the Blue Ridge Mountains. These soils are the centre of the mountain peach industry which has of late years come into considerable prominence.

4.—The Hudson River Shales upon decomposition give rise to a light yellow soil which though shallow and easily washed away, is remarkably fertile when the depth of the soil is taken into consideration. These soils in good seasons with careful treatment produce fair yields of wheat, corn, grass and the cultivation of peaches and other fruits is profitably carried on.

5.—The Trenton limestone gives rise to the finest type of heavy clay soils which consist of the insoluble residue after the lime carbonate has been removed in solution by the percolating rains. These soils on account of the favorable conditions they maintain for the growing crops are well suited to general agricultural purposes. They may, since their texture and relation to the various crops vary so materially, be classified into corn, wheat and grass lands.

6.– The corn lands in the limestone area are the lightest in texture and on account of their loose mellow condition are especially adapted to the cultivation of corn. Too loose and sandy for the heaviest yields of wheat, they do not retain sufficient moisture for a heavy growth of grass although both of these crops are raised.

7.—The wheat lands present a type of soil which has a heavier top soil while the stiff clay is not so far from the surface as it is in the corn lands. The soils are well drained and contain a considerable amount of fragments of disintegrated rock. They produce the finest quality of bright, heavy wheat, and a little more grass than the light loamy corn soils but the production of corn is much less.

8.—The grass lands occupy the lower levels where the finest soil particles have accumulated which have been washed down from the surrounding slopes. These soils are stiff heavy clay which always retain sufficient moisture for a heavy growth of grass. They are too stiff for corn and wheat is apt to run to straw besides there is a tendency to disease on such moist lands.

THE SOILS OF THE HAGERSTOWN VALLEY.

Clarence W. Dorsey.

The general classification of the soils according to the geological formation has been completed for the entire State, with the exception of those areas where the geological formations are, as yet, imperfectly understood. The descriptions of the many different types of soils and their relation to the agricultural crops have been discussed by Professor Whitney in the Fourth Annual Report and in Bulletins 21 and 29 of this station; in Bulletin No. 4 of the Weather Bureau and Bulletin No. 5 of the Division of Soils of the U. S. Department of Agriculture. The chapter on Agriculture in the Maryland World's Fair Book also gives an account of the various types of soils of the State. Besides the account of the soil the volume contains a large map on which the soils and geological formations have been correlated.

The result of this work has been the division of the soils into a large number of distinct soil types. These soil types differ from each other in regard to their geological origin, some being derived from the sands and gravelly loams of the southern part of the State, whereas other soils owe their origin to the hardest rocks, such as granite and gneiss. As these soils are found to differ in their origin, so will they be found to differ in agricultural value when a comparison is made between the light sandy truck soils of the Eastern Shore and the heavy clay lands of the valleys in the Western part of the State so well suited to grass and wheat.

An important feature in the papers just referred to was the discussion of the physical conditions of the soil and the relation to temperature and moisture, as influencing plant growth. It was found that it is not so much a matter of the available plant food contained in the soil as the amount of moisture maintained by the soil, which governs the growth of the plant. Chemical analyses of the leading soil types of the State,* failed to reveal any apparent deficiencies in the amount of mineral constituents known to be necessary for the growth of the various agricultural plants.

Thus it was seen that something else beside the chemical composition must be the controlling factor in plant growth. This controlling factor seems to be the physical condition of the soil, and to it must be referred the many differences in soils rather than to any chemical difference. For example, a light sandy soil will not maintain a heavy growth of grass, while a heavy soil has been found unsuitable for raising early truck. A chemical analysis of the two soils offers no satisfactory explanation for the relation of these soils to truck and grass. It is only when the difference in the physical condition of the two soils is seen and understood that the relation of soils to crops is made manifest. The condition of the sandy soil is such that it will not maintain moisture enough for crops such as wheat and grass, hence these crops will not succeed on such soils. But it is on just such a soil that truck has been found to succeed best, because moisture is scarce and the plant is forced to an early maturity and can be placed on the earliest markets, when it will command a high market price. On the other hand the stiff clay soil maintains such conditions that sufficient moisture is always retained in the soil to insure a heavy plant growth. These crops mature more slowly and consequently need a greater supply of moisture. The more the soils are studied with reference to their varying physical conditions, the greater is the importance attached to these studies in relation to the growth of plants.

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*The chemical analysis of 13 types of soils of the State have been published in Bulletin 21. These analyses were made by Prof. R. L. Packard.

As the general classification of the soils of the state has been completed, the object now is the further and more detailed examination of somewhat limited areas, in which the local variations are slight. The purpose of such an examination is to ascertain if possible, some of the conditions governing the soils, the crops for which they are best adapted, the method of treatment employed in cultivation, and other facts which may serve to advance our knowledge of the many intricate problems presented by the soil in its relations to Agriculture.

The broad fertile valley about Hagerstown was chosen as an area for examination since it offers tolerably uniform soil formation. Considerable work has been devoted to the study of these different soils. A large number of samples have been collected, taken in the usual manner, with an 1½ inch auger with the handle lengthened to 36 inches. All possible data were collected concerning the crops which can be most successfully grown, as well as the yields of the various crops per acre. When a systematic rotation of crops is followed, it was recorded. The attempt was made to find out the effect of the various fertilizers used on the productiveness of the soils. Note was made of the different depths to which the soils are plowed, and the effects of deep plowing on deepening and strengthening the soils. The relative exhaustive effects of the different crops were learned when information could be obtained on this subject. Beside the above factors many other points were taken into account which are known to exert a modifying influence on the moisture and temperature conditions of the soil, as for example the location of a certain soil sample, whether it was taken from a hill field, side slope or bottom land, the exposure to the sun, or "lay of the land," the protection afforded by forests and hills against the wind. However, in this work too much attention must not be paid to mere local features for almost any field offers new and endless problems in every few feet of surface. Hence it is only the broader features which can be studied in detail now, as they must be recognized and understood before an examination can be made of those small problems which serve only to confuse and perplex the student of the soil.

In the present paper we shall first notice the valley where the examination was made, describe briefly the principal rock formations and then take up the different soils. These soils although derived from three rock formations, can be divided into five (5) distinct soil types, all differing from each other in some essential characteristic.

The Cumberland or Hagerstown Valley as it is frequently called, crosses the Western part of the state in Washington County. It is a broad Paleozoic valley which is a continuation of the Shenendoah Valley of Virginia and the Cumberland Valley of Pennsylvania. The Valley lies between the Blue Ridge Mountains on the east and the Alleghanies on the west, and is about 18 to 20 miles in width. The remarkable fertility of the soils together with the fact that the transportation facilities are very good, make the valley a desirable tract of land for general agricultural purposes. Across the valley the surface is comparatively level, as there are no marked contrasts in elevation. The surface is gently rolling, and from many of the broad stretches of level upland the view of the entire width of the valley can be obtained. The general elevation above sea level ranges from 400 to 600 feet. The lowest levels, of course, are along the two streams, the Antietam and Conochocheague, which have not yet been able to excavate their channels much in advance of the general wearing away of the surface of the region. These two streams together with their numerous small tributaries constitute the surface drainage of the valley, which is southward into the Potomac. That the drainage is excellent is shown by the absence of swamps and sluggish streams.

We shall now consider the three principal rock formations in the valley to which the different soils owe their origin. They will be described in ascending geological order, commencing with the oldest.

The Cambrian Sandstone. This occupies a narrow strip at the Eastern side of the valley at the foot of the Blue Ridge Mountains. It is a belt about one-half mile wide, and is continuous throughout the state. This rock formation is a whitish sandstone composed of quartz, feldspar and one of the iron oxides, the sand particles being quite small. Such a rock on decaying ought to give a tolerably heavy soil, as the feldspar would decompose into clay and the quartz grains would remain as a fine sand when the cementing substances had been dissolved out. However, from the location of this formation no great depth of soil can accumulate on account of the steepness of the slope and the washing effect of the rains. This rock formation on account of the small area it occupies, even if the conditions were more favorable, could not give rise to a large soil formation. The surface is covered with loose stones, and the soil is mingled with these large flat sandy stones not entirely disintegrated.

The Trenton Limestone Formation. This is the principal rock formation in the valley and from it the most valuable soils are derived. It was deposited during the latter part of the Cambrian and early part of the Silurian pediods*. The formation consists of a series of limestones and dolomites containing about 80 per cent. of carbonate of lime, 15 per cent. of carbonate of magnesia and 5 per cent. of insoluble matter chiefly silicates*. One can easily recognize this formation by means of the harder layer of massive limestone sticking out of the ground every few yards and by the deep red soils which rest upon it. Limestones usually decompose into the finest type of heavy clay soils. They have been deposited in deep waters where only the finest sediments were transported by the currents, as the coarsest sediments brought down by the rivers are soon dropped close to the shore. These sediments were mingled with the remains of broken shells and coral and the whole mass is cemented together by the lime carbonate held in solution by the sea water. If such a mass of sediments and remains of animals be subjected to pressure by being buried under subsequent sediments, a firmly compacted limestone is the result in which all trace of the original shape of the shells may be entirely obliterated. Such was probably the history of the Trenton limestone, and it now bears but little resemblance to the mass of calcareous ooze which rested on the bottom of a former sea. When the lime is in the form of a carbonate as it is in the Trenton limestone, the rock rapidly decomposes, because the lime is dissolved by the rain water holding carbon dioxide in solution. Pure water does not attack limestone rock, but rain water is seldom pure, as it always contains carbon dioxide dissolved in it, so that the water from the springs and wells in a limestone country is usually hard on account of the lime it contains which it has dissolved out of the rocks.

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*14th Annual Report, U. S. Geological Survey. Arthur Keith.

The soils arising from such a rock are merely the insoluble particles of the rock left behind when the lime has been removed in solution. Since these insoluble particles are usually small it is easily recognized why limestones give rise to finely divided soils. These soils are nearly always poor in lime which illustrates the great solvent power of ordinary rain water.

In connection with the limestone formation it may be well to speak of the variations which occur in the formation. These variations are especially manifested in the series of sandy and slaty shales which occur on the Eastern side of the valley interbedded with the limestones. These shales although somewhat calcareous, do no contain so much soluble matter as the limestones, consequently the soils contain a greater amount of undecomposed fragments of rock. However these mixed soils are nearly as deep and are about as fertile as the limestone soils, indeed for some crops they are even of more value than the typical limestone soil. These shales may be readily distinguished by their purplish color and by the slight ridges they make along the valley about five miles east of Hagerstown.

The Hudson River Shales. This is the formation from which the so-called "slate" lands are derived. The shales form a ridge about two miles in width along the Western side of the valley. They present rather a bold type of topography as they constitute a series of steep hills with the Conochocheague river winding about among them. Originally deposited as a series of beds of fine mud, slightly calcareous, they now consist of fine grained brown and yellowish shales. From the age of these shales one should expect to find quite a deep soil resting upon them, as finely textured as the limstone soils, but such is not the case. When rain water falls upon the limestones it dissolves the lime and leaves behind only the insoluble portions of the rock. These shales, although somewhat calcareous, contain about 80 per cent. of insoluble matter,* whereas the limestone contained only about 5 per cent. of insoluble matter. Consequently when the rains fall upon these shales they cannot dissolve so large an amount of the rock as they do in the case of the limestone. Moreover the particles are light and so they are washed away almost as rapidly as they are set free. So it will be seen that these closely compacted mud rocks do not decompose in the manner in which the other rocks did that have been mentioned, but instead they split and fracture along the innumerable joint and cleavage planes until the whole surface may be strewn with a considerable layer of small rectangular bits of shale.

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*These Results are from the analyses of 115 beds, determined by J. P. Lesley, of the Penn. State Geological Survey.

These shales are therefore covered with a shallow layer of light yellow soil through which are scattered the pieces of flat rock. A striking illustration of the different way in which rain water acts upon the limestone and shale may be seen if one will but compare the small streams in the two regions after a shower; in the former they will remain quite clear, while in the latter region the streams carry away a heavy load of sediments because the rains could not find such easy accesss into the practically impervious rocks, but must of necessity run off the surface carrying away the light particles of soil.

As we have spoken of the principal rock formations we may now consider the soils which have been derived from the decomposition of them. These will be described in the order of their agricultural value and relative area.

The Limestone Soils. This soil formation is the most extensive in the valley and is a very valuable tract of land for general agricultural purposes. A similar soil, equally as fertile, is found in the valley around Frederick, but this is much more limited in extent. These limestone soils are carefully and thoroughly cultivated by a properous class of farmers. The large barns, substantial farm houses, and general look of improvement readily proclaim the country to be a good farming district.

These soils are derived from the decomposition of the limestone rock and have the red color so characteristic of limestone soils. They are composed of finely divided particles, so arranged as to allow perfect drainage through them, they are moreover sufficiently heavy to retain plenty of moisture in them. A heavy, yet well drained soil is indeed a desirable one, allowing as it does, all the rainfall to enter the soil, as there is experienced none of the bad effects of washing so commonly seen on plowed slopes. Again there is the minimum loss resulting from dry seasons, because of the ability of the soil to store up sufficient moisture so necessary to plant growth. Generally these stiff red clays are overlain by a covering of light loam. This loam varies in thickness from only a few inches, to places where it has accumulated to a depth of over 22 inches. The depth and nature of this loam undoubtedly has a marked influence on the distribution of crops, as we shall attempt to prove further along in the discussion. As has been stated these soils are carefully cultivated. Usually a systematic rotation of crops is followed, but this varies considerably according to the type of land, whether it is heavy or light, and the way the soils are "exhausted" by certain crops. On the lighter textured lands it is customary, after corn, to sow to wheat for two years, usually two, then sow to timothy which is left as long as it holds. On the heavier lands wheat is often sowed four or five years in succession, occasionally seven, while the field may not be sowed to grass oftener than once in twenty years. Of course the very heaviest of these lands are kept in grass, which always succeeds best on a heavy soil. One great advantage to be derived from changing the crops frequently, is the different depths to which the fields are plowed, thus stirring and mixing the soil from the different depths. As far as could be ascertained deep plowing (10 inches) gives better results than shallow plowing (6-7 inches). The reason for this is obvious, the soil is deepened and strengthened and the manures and vegetable matters are buried more deeply, thereby allowing them to decay and enrich the soil. Deep plowing is likewise beneficial in turning up fragments of undecomposed rock, subjecting them to the decaying influences at the surface. The use of the subsoil plow seems to be practically unknown in this region, except for the occasional use made of it when peach orchards are set out. With the exception of this use, it is rarely resorted to. Indeed many of the younger men on the farms do not even know what a subsoil plow is. Undoubtedly subsoiling would be very beneficial to these heavy soils, stirring them to a much greater depth than the common plows, and making them more accessible to the passage through them of air and rainfall.

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*Geological Atlas of the United States. Folio No. 10, page 3.

Fertilizers are quite generally used on these soils. South Carolina rock, raw bone and dissolved bone are the chief commercial fertilizers. Besides these fertilizers, stable manures are freely used and occasional applications of lime. Regarding the use of lime there seems to be a great diversity of opinion. On the eastern side of the valley the practice is quite common, while on the western side lime is seldom used, when however lime is used on the soils west of Hagerstown as good results are noticed as on the eastern side, so it would appear to be more a matter of custom than anything else. The manner in which the lime is prepared is to pry up the loose stones sticking out of the fields, burn them in kilns and spread the burned lime directly on the fields. In this manner not only is the soil benefitted by the application of the lime, but the surface is cleared of the loose stones encumbering it. The action of lime on these soils is doubtless to flocculate the fine particles of clay, making them more open and porous.

In going across the valley one soon becomes acquainted with the fact that there are variations in these limestone soils. This is manifested by differences in the appearance of the soils and in the crops most successfully grown. In places the soils seem to be better adapted to corn, although wheat and grass are grown with a fair degree of success. Again we find soils which make the finest type of wheat lands and still others which are devoted almost exclusively to grass. Tables have been made out with the yields per acre of the various crops and from these it is seen that the corn, wheat and grass lands, as we have chosen to call them, are correctly named. We shall now take up the different types of soils and endeavor to show wherein they differ and why they produce a certain crop more successfully than the other soils.

The Corn Lands. These are, generally speaking, the broad stretches of level upland. They are found on examination to be the coarsest textured of the three types of limestone soils. From their position along the higher levels, we should expect the drainage to be away from them instead of toward them as it is on the lower levels. Moreover the depth at which the stiff red clay is found, has a marked influence on the amount of moisture which these soils will contain.

These lighter loams are not a subsequent deposit as might be inferred, but merely the coarsest products of rock decomposition from which the clay has been washed down to the lower levels. Hence the depth of the covering of light loam may vary considerably in the same field according to the exposure of the field to the washing effects of rains.

In the papers previously referred to by Professor Whitney, he has shown that the more clay which a given soil contains, the greater will be the resistance to the rainfall when it enters the soil.

A heavy claysoil will offer somuch resistance to the passage of water through it on account of the finely divided condition of its soil particles, that it will retain it for a considerable length of time. A coarse, sandy soil on the other hand acts as a very porous substance and offers but little resistance to the passage of water through it, so that such a soil quickly dries out even after heavy rains because of the inability of the sandy particles to prevent the water from sinking through it. Clays, however when they are "puddled" or compacted together by stirring, offer so much resistance to the penetration of rainfall that they are almost impervious to it, and water passes through them very slowly, if indeed it enters them at all. But puddling rarely occurs in the case of the limestone soils if they are carefully cultivated.

Ordinarily the clay in these corn lands is covered with a thickness of from ten to twenty inches of light loam. These loams contain a considerable amount of sand and are therefore not so retentive of moisture, and a light loose condition of the soil is thus maintained. This light loamy soil seems to be just the kind of soil best adapted to the raising of corn. Such a soil never bakes hard, but always preserves its light-mellow character, so that they are easily stirred and kept in good condition. Although these soils are so well adapted to corn, they are hardly heavy enough for either wheat or grass, but both are raised. They are not firm enough for wheat, which requires a soil that will not "heave" as these soils do with the alternate freezings and thawings of the winter season. Notwithstanding the fact that they are rarely heavy enough for grass, they are usually sowed to grass to allow them to rest and get into good condition again after a period of hard farming. These soils require much more attention than the heavier soils to keep them from becoming "exhausted" or worn out.

The yields of the various crops per acre varies considerably of course with the treatment and season. In a good season, with careful treatment it is said that 90 bushels of shelled corn per acre can be raised, although 70 bushels can be counted a fair average yield. From 15 to 30 and even 40 bushels of wheat are raised, but 26 to 28 bushels represents a liberal estimate. One and one-half tons per acre is given as the yield of grass, but with good seasons when there is plenty of rain as much as 2 tons can be harvested.

Comparing these soils with the soils of the Shenandoah Valley in Virginia, it is seen that much the same type of soils is found there. The light loamy soils are the best corn lands, although wheat and grass are likewise grown. The examination of these Virginia soils was made by Professor Whitney.

A large number of the samples collected from representative corn lands have been analyzed to determine the texture of these soils. This method of mechanical analysis determines the percentage of the different amounts of fine and coarse material in a soil, the particles ranging in size from .0001mm. to 2mm. The manner in which such a separation of soil particles is made, to allow the particles to subside in beakers of water. The coarsest materials are precipitated first and then separated by means of brass sieves. The determination of the separation of the smallest particles is made by the compound microscope using an eyepiece micrometer. The importance of such an analysis is at once apparent. One can tell the exact amounts of clay, silts and sands a soil contains and from these amounts determine the relation of the soil to moisture. The following tables give the analyses of a number of the best corn lands, the analyses are of both the soils and subsoils. Naturally the subsoils contain more clay than the top soils, as the top soils are the light sandy loams. The change in color between the soils and subsoils is unusually quite distinct. The soils here are usually from 10 to 12 inches deep, while the subsoils are from 24 to 26 inches in depth. The analyses are arranged with reference to the amounts of clay they contain. From these analyses it is seen that the amounts of the coarser grades of sands are quite small, as the greater portion of the soil is made up of very fine sand and silt, while the per cent. of clay ranges from 14 to 19.

In the analyses of the subsoils given the amounts of clay vary considerably more than in the soils. Many of the subsoils analyzed are those immediately under the top soils. It follows as a general rule with the soils under discussion that the less clay they contain, the better adapted is the soil for raising corn. On the field from which 2790 was taken. 90 bushels per acre of shelled corn is said to be by no means an uncommon crop. On sample 2755 it is customary to plant corn several years in succession, but as the field is carefully cultivated and fertilized no bad results or deterioration of the soil has resulted. Successive crops of corn are usually considered quite harmful to the soil because it is left exposed to the heavy spring rains. The idea commonly held by farmers that freezing injures the soil is erroneous, as the effect of alternate freezes and thaws is to disrupt the soil particles and reduce them to a finer state of division. The injury is experienced when the rains wash away these fine particles as they do to a considerable extent when the field is devoid of any protective covering.

These soils, although such fine corn lands, are not adapted to the cultivation of peaches. Frequent attempts have been made with them, but they are always unsuccessful, however such is not the case with the wheat lands which will be considered next.

Wheat Lands. The finest type of wheat lands in the limestone area occur on the east side of the valley. These soils may be regarded as a kind of mixed soil, because the limestone is interbedded with minor beds of shale. The soil is darker colored than the corn lands, approaching in places a deep purple color. To this difference in color may be due a difference in temperature, as dark soils are usually regarded as warmer than light colored ones. The amount of loose stones upon the surface may also exert some influence in raising the temperature, since stones store up the heat from the sun during the day time and slowly give it out during the night, thereby warming the soils. The loam which overlies the clay in these wheat soils is not so deep as it is in the case of the corn lands, while it is appreciably heavier, even upon a superficial examination. It appears to be much richer in organic matter, although analyses show but a slight amount of difference. One great difference between the corn soils and the wheat soils is the large amount of fragments of undecomposed rock in the wheat soils, which undoubtedly has a considerable influence upon the structure and drainage of these soils.

On these soils we find the finest quality of wheat produced. Not only is it a better quality of wheat, but more can be raised per acre than on any of the other limestone soils. It is the kind known as "bright," heavy wheat, which always commands the highest price in the markets. Some of the fields in this area produce as much as 55 bushels per acre, although 33 bushels is said to be a good average crop. Corn does quite

MECHANICAL ANALYSIS OF SOILS.

FROM TYPICAL CORN LANDS IN LIMESTONE AREA.

No.	LOCALITY.	DESCRIPTION.	MOISTURE IN AIR-DRY SAMPLE.	ORGANIC MATTER.	GRAVEL.	COARSE SAND.	MEDIUM SAND.	FINE SAND.	VERY FINE SAND.	SILT.	FINE SILT.	CLAY.
					2-1 mm.	1-.5 mm.	.5-.25 mm	.25-1 mm.	.1-.05 mm.	.05-.01 mm.	.01-.005 mm.	.005-.0001 mm.
			Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per. Ct	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.
2727	Hagerstown, 3½ mi. S. E...	Light Loam 0-10 in	1.25	3.66	1.02	1.12	1.26	5.50	28.85	34.29	9.27	14.15
2747	Leitersburg, 3 mi. S.,......	Loam 0-12 in........	1.72	5.38	.77	.85	1.15	3.14	18.74	39.99	12.51	16.19
2729	Hagerstown. 3 mi.. E.......	Loam 0-10 in.......	1.51	3.40	1.55	1.43	1.09	4.05	22.35	37.54	10.16	16.82
2750	Chewsville, 1½ mi. W	Loam 0-10 in........	1.48	4.12	.69	1.37	2.36	5.94	20.08	35.54	9.16	19.57
2754	Hagerstown. 1½ mi. W....	Loam 0-10 in........	1.68	4.45	.62	1.03	1.75	1.83	15.57	43.91	10.61	19.63

MECHANICAL ANALYSIS OF SUBSOILS.

FROM TYPICAL CORN LANDS IN LIMESTONE AREA.

No.	LOCALITY.	DESCRIPTION.	MOISTURE IN AIR-DRY SAMPLE.	ORGANIC MATTER.	GRAVEL.	COARSE SAND.	MEDIUM SAND.	FINE SAND.	VERY FINE SAND.	SILT.	FINE SILT.	CLAY.
					2-1 mm.	1-.5 mm.	.5-.25 mm.	.25-.1 mm.	.1-.05 mm.	.05-.01 mm.	.01-.005 mm.	.005-.0001 mm.
			Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.	Per Ct.
2790	Hagerstown, 3 mi. S. E...	Loam 12-20 in......	1.05	2.45	.66	1.53	3.22	5.71	30.62	24.39	9.26	21.06
2728	Hagerstown, 3½ mi. S. E..	H'y Loam 10-26 in..	1.38	3.31	.33	.77	1.15	5.92	31.77	27.09	4.60	23.79
2748	Leitersburg, 3 mi. S.......	Loamy Clay 12-24 in	1.49	3.90	.57	.84	1.14	2.25	24.16	31.89	9.63	24.38
2732	Hagerstown, 4 mi E.......	Blk. Cl'y Loam 12-26	1.86	7.96	1.01	2.08	3.38	6.93	15.56	26.12	8.43	24.94
2751	Chewsville, 1½ mi. W	Loamy Clay 10-24 in	1.48	3.68	.28	.63	1.46	3.78	17.31	31.25	9.26	30.60
2755	Hagerstown, 1½ mi. W...	Stiff Clay 10-26 in...	1.56	3.34	.75	.93	1.40	1.15	12.40	35.20	10.01	32.80
2730	Hagerstown. 3 mi. E......	Stiff Clay 10-26 in ..	1.87	4.05	.47	.48	.51	3.16	23.66	25.21	5.28	35.44

well, but it is not so successful as on the corn soils, as 50 to 60 bushels per acre is counted to be a good yield. Grass of course does better on these heavier soils, although difficulty is sometimes experienced in harvesting the full crop on account of the loose stones upon the surface. A little less than 2 tons per acre is said to be a good average crop.

This type of soil not only occurs in this State, but it also extends into the great limestone valley of Virginia and there it is also found to make good wheat lands.

As has been stated, peaches succeed fairly well on these soils and large tracts of lands are employed in their cultivation. The most serious drawback to raising peaches is the damage inflicted by the late frosts in the spring, after the trees are in bloom. The table of analyses of several typical wheat soils shows they contain more clay than the corn soils, although they also contain a greater amount of the coarse grades of sand.

The analyses of the subsoils given show quite a variation in amounts of clay, besides they contain even more of the coarser grades of sand than the soils. As samples 2791 and 2740 are from fields producing the best quality of wheat they may be regarded as the finest type of wheat soils. They contain about 30 per cent. of clay and a large amount of the coarser grades of sand.

The Grass Lands. These are generally situated on the lower levels where the finest particles of soils have accumulated, which have been washed down from the hills and slopes. Ordinarily these lands are along the rivers and streams, although occasionally some fields from their situation receive all the drainage from neighboring slopes and are thus enabled to furnish sufficient moisture for a heavy growth of grass. The amount of moisture in such a field does not depend so much upon the texture of the soil, which may be light, as it does on the drainage conditions of the surrounding soils. Generally these grass lands are the heaviest clays which even in poor seasons maintain favorable climatic conditions for the growing crops, and a heavy plant growth is always insured. Wheat on these soils is late in maturing, puts on too great a growth of straw, and the heads are small and imperfectly developed. There is also manifested a tendency to disease on these wet lands. The yield per acre is about the same as on the corn lands, but the quality is not so good. Corn does even more poorly on these soils than it does on wheat lands, about 55 bushels per acre being the average crop. The soil is too stiff for corn and is apt to bake after heavy rains. It is to the growth of grass that these soils are best adapted, as they average at least 2 tons per acre, although 3 and more are sometimes harvested.

MECHANICAL ANALYSES OF SOILS.

FROM TYPICAL WHEAT LANDS IN LIMESTONE AREA.

No.	LOCALITY.	DESCRIPTION.	MOISTURE IN AIR-DRY SAMPLE.	ORGANIC MATTR.	GRAVEL. 2-1 *mm.*	COARSE SAND. 1-.5 *mm.*	MEDIUM. SAND. .5-.25 *mm.*	FINE SAND. .25-1 *mm.*	VERY FINE SAND. .1-.05 *mm.*	SILT. .05-.01 *mm.*	FINE SILT. .01-.005 *mm.*	CLAY. .005-.0001 *mm.*
			Per Ct.	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct*	*Per Ct.*	*Per Ct.*
2737	Leitersburg, 4 mi. S. E....	Loam 0-10 in........	1.29	4.54	1.13	1.85	1.83	3.43	11.90	44.40	12.29	17.32
2741	Cavetown,..................	Black 0 10 in........	.85	3.48	2.77	3.66	7.26	10.48	22.45	18.70	7.36	18.60
2733	Hagerstown, 5 mi. E	Light Loam 0-12 in	1.76	4.30	4.53	3.78	3.28	5.00	15.47	34.05	8.99	19.81
2776	Clear Spring, 1½ mi. E....	Loam 0-10 in........	.56	4.42	2.80	3.44	9.03	11.94	21.29	17.73	6.75	20.79
2770	Clear Spring. 4 mi. E.....	Heavy Loam 0-10 in	1.17	5.07	.78	1.55	1.45	1.76	18.35	32.54	9.41	26.96
2735	Chewsville, ½ mi. E.	Loam 0-10 in	3.52	3.74	1.54	1.65	1.70	3.57	9.75	35.39	11.39	29.53

MECHANICAL ANALYSES OF SUBSOILS.

FROM WHEAT LANDS IN LIMESTONE AREA.

No.	LOCALITY.	DESCRIPTION.	MOISTURE IN AIR-DRY SAMPLE.	ORGANIC MATTER.	GRAVEL. 2-1 *mm.*	COARSE SAND. 1-.5 *mm.*	MEDIUM SAND. .5- 25 *mm.*	FINE SAND. .5- 1 *mm.*	VERY FINE SAND. .1-.05 *mm.*	SILT. .05-.01 *mm.*	FINE SILT. .01-.005 *mm.*	CLAY. .005 .0001 *mm.*
			Per Ct.	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*
2734	Hagerstown, 5 mi. E......	Clay Loam 12-26 in.	3.22	3.70	3.17	3.89	3.66	5.64	16.96	29.27	7.15	24.05
2742	Cavetown.............	Loamy Clay 10-24 in	1.16	2.71	1.80	2.90	5.00	8.97	26.50	20.36	7.02	24.34
2746	Smithsburg, 1 mi. N. W...	Clayey Loam 12-26	2.86	4.35	1.39	2.17	2.72	4.78	20.30	29.11	8.90	25.59
2738	Leitersburg, 4 mi. S. E....	Loamy Clay 10-26 in	1.78	3.80	1.35	1.81	2.06	3.37	11.57	33.76	11.65	28.19
2740	Cavetown, ½ mi. W........	Loamy Clay 10-26 in	1.84	4.64	2.75	3.80	3.95	5.76	13.36	24.24	8.17	31.56
2791	Hagerstown, 5 mi. E.......	Loamy Clay 12-24 in	1.73	1.80	5.15	4.82	4.02	5.65	18.12	19.25	7.36	32.17
2777	Clear Spring, ½ mi. S. E...	Stiff Clay 10 18 in..	3.92	6.42	1.00	1.60	3.63	5.37	8.19	24.79	5.04	42.31
2736	Chewsville, ½ mi. E........	Stiff Clay 10-26 in...	2.00	4.56	1.12	.90	1.00	2.19	8.34	27.96	8.24	43.15

The analyses of these soils show their extreme fine texture, as the soils contain about 28 per cent. of clay, while the subsoils have about 40 per cent. of clay. These strong soils are capable of standing much harder farming than any of the soils mentioned, but care must be exercised to prevent their becoming puddled, by plowing when too wet.

Hudson River Shale Soils. These soils commonly called the slate lands, occupy a ridge on the western side of the valley about two miles in width, traversing the State in a slightly N. E. and S. W. direction. The ridge is continuous in the states on either side, and the soils derived from its disintegration have a remarkable uniformity. These slate soils have not so great an agricultural value as the limestone soils, but they are quite fertile for such shallow soils. In places, however, they are barren because all the finer particles of soil have been washed away and the scant soil in these places can only put forth a growth of pines. Careless farming has also allowed the soils to be washed off the steep slopes, leaving in its place a layer of loose shale rocks, which will require a long period of time before they can be converted into fertile soil.

None of these soils exceed 20 inches in depth, but when properly handled and with good seasons they almost rival the limestone soils in fertility. On an average 15 bushels of wheat per acre can be raised, 40 to 45 bushels of corn and about 1 ton of grass. The most serious drawback to these soils is their tendency to bake, which is probably due to the extreme fineness of the clay particles. Lime is used extensively on these soils with very good results. One of the advantages derived from the use of lime is undoubtedly the further disintregation of the shales, since lime is known to have considerable influence in promoting rock decay. Peaches succeed fairly well on these "slate" lands, but there is the danger always present in valleys arising from late spring frosts.

MECHANICAL ANALYSES OF SOILS.

FROM TYPICAL GRASS LANDS IN LIMESTONE AREA.

No.	LOCALITY.	DESCRIPTION.	MOISTURE IN AIR-DRY SAMPLE.	ORGANIC MATTER.	GRAVEL.	COARSE SAND.	MEDIUM SAND.	FINE SAND.	VERY FINE SAND.	SILT.	FINE SILT.	CLAY.
					2-1 *mm.*	1-.5 *mm.*	.5-.25 *mm.*	.25-1 *mm.*	.1-.05 *mm.*	.05-.01 *mm.*	.01-.005 *mm.*	.005-.0001 *mm.*
			Per Ct.	*Per Ct*	*Per Ct*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*
2772	Clear Spring, 3½ mi. E....	H'y Loam, 0-10 in.	1.53	4.25	.90	1.55	2.90	4.87	23.33	33.22	5.71	21.73
2788	Williamsport, 3 mi. N. E..	....	1.49	4.52	1.51	1.89	2.76	5.58	16.53	34.08	4.67	25.77
2774	Clear Spring, 1 mi. S. E....	Loam, 0-10 in	.92	3.81	.35	1.20	4.06	8.25	20.10	28.43	7.09	26.70
2758	Hagerstown 2¼ mi. S. E.	Red Clay, 0-10 in...	2.65	5.05	2.55	2.60	2.69	2.69	7.96	29.03	7.90	36.77

MECHANICAL ANALYSES OF SUBSOILS.

FROM TYPICAL GRASS LANDS IN LIMESTONE AREA.

No	LOCALITY.	DESCRIPTION.	MOISTURE IN AIR-DRY SAMPLE.	ORGANIC MATTER.	GRAVEL.	COARSE. SAND.	MEDIUM SAND.	FINE SAND.	VERY FINE SAND.	SILT.	FINE SILT.	CLAY.
					2-1 *mm.*	1-.5 *mm.*	.5-.25 *mm.*	.25- 1 *mm.*	.1-.05 *mm.*	.05-.01 *mm.*	.01-.005 *mm.*	.005-.0001 *mm.*
			Per Ct.	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*
2773	Clear Spring, 3½ mi. E.....	Stiff Clay 10-24 in...	2.06	4.77	.54	1.17	2.41	4.03	21.20	25.12	7.29	31.41
2775	Clear Spring, 1 mi. S. E....	Loamy Clay 10 24 in	.58	3.58	.44	1.05	3.51	7.26	21.04	23.02	7.49	31.62
2757	Hagerstown, 2 mi. W.......	Stiff Clay 10-24 in...	2.41	4.92	1.15	1.13	.86	1.05	7.00	30.97	9.94	40.24
2771	Clear Spring, 1½ mi. S E...	Stiff Clay 10-24 in...	1.41	4.60	.51	.73	1.00	1.18	9.26	34.32	7.47	40.93
2759	Hagerstown, 2¼ mi. W....	Stiff Clay 10 24 in...	2.43	5.00	1.57	1.77	1.73	1.77	4.95	24.49	9.59	43.17
2789	Williamsport 3 mi. N. E...	Stiff Clay 10-20 in...	2.51	6.17	1.70	1.01	1.44	1.19	3.79	28.21	7.34	47.05

The analyses of these soils are interesting as they differ considerably from the analyses of the limestone soils given. The amount of the coarser grades of sand is quite large, the amount of clay is also relatively large, while the silts and finest sands are generally small. Thus it will be seen that this soil is a mixture of rather coarse material with the finest clay. These analyses do not take into account the large amount of shales in the soils, as all particles larger than 2mm. are excluded from the analyses. Although no analyses have been made of the soils, they would show a still greater percentage of the three coarse grades of sand.

The Cambrian Sandstone Soils. These are the soils derived from the decay of the whitish Cambrian sandstone already described. With these soils it may be well to include what the farmers term the "Mountainous" soils, the soils along the base of the mountains. All of these soils are mixed as they are derived from the various rock formations of which the mountains are composed. The soils resulting from the decay of these rock formations are more or less jumbled together on account of the tendency, especially manifested on the steep slopes, for the soils to continually creep downward. The washing effect of the rains and melting snows, aided by the force of gravity, make it wellnigh impossible for a soil to remain long in any given place in such localities. Great care must be taken in the cultivation of such slopes or the shallow covering of soil is soon swept downward.

These soils with their western exposure, are largely used for the cultivation of mountain peaches, although corn and wheat are sometimes raised in the orchards on the slopes which are not too steep. The cultivation of such slopes should not be encouraged, as it considerably hastens the destruction of the soil by stirring it, making it easier for the rains to wash it away. The orchards should be kept in grass, even though they would afford only scant pasturages, as the firm sod seems to check the rapid waste of soil.

The location which seems most desirable for peach orchards is the narrow strip about half a mile wide just at the base of the mountains, about 800 and 900 feet above sea level. However, with the increasing development of the peach industry, orchards are continually encroaching on the mountain forests. At the elevations mentioned the effects of the late spring frosts are not so marked, while the winters are not so severe as upon the top of the mountains. In this locality peaches ripen from July 15th to August 20th. The late peaches especially command good market prices, because they have only to compete with peaches grown in similar localities.

MECHANICAL ANALYSES OF SUBSOILS.

FROM HUDSON RIVER SHALES.

No.	LOCALITY.	DESCRIPTION.	MOISTURE IN AIR-DRY SAMPLE.	ORGANIC MATTER.	GRAVEL.	COARSE SAND.	MEDIUM SAND.	FINE SAND.	VERY FINE SAND.	SILT.	FINE SILT.	CLAY.
					1-2 *mm.*	1-.5 *mm.*	.5-.25 *mm.*	.25-1 *mm.*	.1-.05 *mm.*	.05-.01 *mm.*	.01-.005 *mm.*	.005-.0001 *mm.*
			Per Ct.	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*
2763	Huyette, ¼ mi. W........ ..	Loam 10 20 in......	1.65	4·40	2.98	3.83	5.66	15.08	19.44	18.80	6.69	21.20
2769	Clear Spring, 5 mi. E.......	Gravelly Loam 8-20	4.04	3.57	11.78	11.44	9.67	7.75	7.62	16.42	6.61	21.75
2767	Huyette, 2 mi. W............	Gravelly Loam 8-14	1.73	4.33	6.50	5.69	4.00	5.35	12.07	27.58	11.08	22.68
2785	Williamsport, ½ mi. N.....	Sandy Loam 8-18 in	1.67	3.40	1.28	1.54	2.97	15.12	22.85	21.26	5.50	24.27
2765	Huyette, ½ mi. W..........	Gravelly Loam 8-16	1.47	4 60	6.65	6.35	6.40	10.50	13.48	16.77	8.44	25.50

In the analyses given it should be remembered that no allowance is made for the coarse gravel and stones contained in these soils. The analyses of 943, 939, and 941 have been published before in Bulletin 29 of this station.

No analyses of any of the intermediate soil types are given. These intermediate types partake of the nature of so many different rock formations that it is very difficult to distinguish them. The change between the limestone soils and the mountainous soils is quite gradual, the soil becomes more shallow and more stony, until we have a typical mountainous soil of which the Cambrian Sandstone soil is so good an example.

In the last table has been placed the different types of soils which have been described. Besides giving the names of the soils, the yields per acre, geological formation, as well as the amounts of sands, silt and clay the soils contain, are given. It may be useful in showing some of the relations of the various soils.

MECHANICAL ANALYSES OF SUBSOILS.

FROM PEACH LANDS. CAMBRIAN SANDSTONE.

No.	LOCALITY,	DESCRIPTION.	MOISTURE IN AIR-DRY SAMPLE.	ORGANIC MATTER.	GRAVEL. 2-1 *mm.*	COARSE SAND 1-.5 *mm.*	MEDIUM SAND. .5-.25 *mm.*	FINE SAND. .25 1 *mm.*	VERY FINE SAND. .1-.01 *mm.*	SILT. .05 .01 *mm.*	FINE SILT. .01-.005 *mm.*	CLAY. .005 .0001 *mm.*
			Per Ct.	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per Ct.*	*Per. Ct.*
943	Smithsburg,................	....	2.11	5 63	2.54	2.99	3.43	5.05	16.72	39.34	8.58	13.02
939	Smithsburg,................	....	1.75	4.87	3.35	3.95	7.54	10.03	16.79	27.45	7.08	15.55
744	Cavetown, 1 mi. S. E......	... .	1.28	4.55	4.69	3.39	3.54	6.50	18.36	28.09	10.59	18.86
2911	Smithsburg. 1 mi. East....	....	1.66	3.84	2.73	3.01	4.03	6.25	17.21	36.71	12.20	22.32

SOIL.	YIELD OF CROPS PER ACRE.	GEOLOGICAL FORMATION.	SAND.	SILT.	CLAY.
Mt. Peaches............	....	Cambrian Sandstone..................	35	40	18
Slate Lands...........	15 bus. Wheat, 40 bus. Corn, 1 ton Grass........	Hudson River Shales..........	40	30	23
Corn Lands............	26 bus. Wheat, 70 bus. Corn, 1½ tons Grass.. ...	....	30	40	25
Wheat Lands..........	33 bus. Wheat, 58 bus. Corn, 1 3 5 tons Grass....	Trenton Limestone..............	25	40	30
Grass Lands...........	26 bus. Wheat, 56 bus. Corn, 2 tons Grass........	....	20	35	40

MARYLAND

Agricultural Experiment Station.

Ninth Annual Report.

College Park, Md.

1896.

MARYLAND
Agricultural Experiment Station.

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Located on the B. & O. R. R., 8 miles N. of Washington, D. C.

NOTICE.

The bulletins of the Station will be mailed free to any citizen of Maryland who sends his name and address to the Station for that purpose.

Correspondents will please notify the Director of changes in their post-office address, or any failure to receive the bulletins.

ADDRESS,

MARYLAND AGRICULTURAL EXPERIMENT STATION,
COLLEGE PARK, MD.

COLLEGE PARK, PRINCE GEORGE'S COUNTY, MD.

January 30th, 1897.

To His Excellency, Lloyd Lowndes,

Governor of Maryland.

Dear Sir:—

In accordance with the provisions of Section No. 3, of Act of Congress, "To Establish Agricultural Experiment Stations, etc." I beg leave to submit my report of the operations of the Maryland Agricultural Experiment Station, for the year ending December 31st, 1896; and also a statement of the receipts and disbursements for the fiscal year ending June 30th, 1896, covering the ninth annual appropriation.

Very respectfully,

ROB'T H. MILLER,

Director.

NINTH ANNUAL REPORT

—OF THE—

Maryland Agricultural Experiment Station

FOR THE YEAR 1896.

REPORT OF THE DIRECTOR.

Station Staff.—I have to note the following changes in the working force of the Station during the past year: First, was the appointment of Professor W. G. Johnson to the position of Entomologist, to fill the vacancy caused by the death of Prof. C. V. Riley. Prof. Johnson holds the position of State Entomologist as well as Entomologist for the College. His headquarters are at the Experiment Station.

The other changes were the appointment of Dr. S. S. Buckley as Veterinarian, and Mr. C. W. Dorsey as Assistant Physicist to Prof. Whitney to succeed Mr. Sothoron Key, who resigned his position.

Publications.—During the past year the following publications have been issued:

January, 1896, Eighth Annual Report.

February, 1896, Bulletin No. 37, Special Issue, Composition of Commercial Fertilizers sold in this State.

March, 1896, Bulletin, No. 38, Potato Experiments.

April, 1896, Bulletin, No. 39, Spray Calendar.

August, 1896, Bulletin, No. 40, Special Issue, Composition of Commercial Fertilizer sold in this State.

September, 1896, Bulletin, No. 41, Test of Methods of Preparing and Feeding Corn Fodder.

October, 1896, Special Issue, Bulletin, No. 42, The Maryland Trees and Nursery Stock Law and Other Information of Special Interest to Nurserymen and Fruit Growers.

December, 1896, Bulletin, No. 43, Report Upon the Value of a New Corn Product.

December, 1896, Bulletin, No. 44, Soils of the Hagerstown Valley.

Permanent Improvements.—The expenditures for the past twelve months for permanent improvements have been much less than usual, because of the necessity of equipping the dairy department, which was established last year; one of the principal items of expense in this equipment being the dairy herd, twenty cows having been purchased, four of which are registered Jerseys and two registered Guernseys.

Correspondence and Mailing List.—One of the evidences of the growing interest in the Station work are the letters which come to us from all sections of the State making inquiries as to the various matters relating to the farmer's calling. While considerable time is consumed in attending to this large correspondence, we feel that it is time well spent, as aside from the information which is thus disseminated, the Station is by this means securing a closer relationship with the farmers of the State.

The mailing list is constantly growing. Nearly every mail brings requests for the bulletins of the Station.

Visitors.—There have been about the usual number of visitors to the Station during the past year. As we have stated in previous reports, it is our desire to have as many of the farmers of the State visit us as possible, as we believe in no other way can so good an idea be had of the work in progress here. We would suggest to those who contemplate a visit to us the coming year that the time of greatest interest is in the early summer when the crops are growing.

Fairs and Institutes.—The Station made no exhibit at any of the fairs of the State the past fall, although we received numerous requests from various associations to attend their exhibitions. The coming year, if time and means permit, we shall hope to resume our work in this field.

The officers of the Station are taking part in the Farmer's Institute meetings which are being held throughout the State this winter, under the provisions of the law enacted by the last Legislature establishing a Department of Farmers' Institutes.

EXPERIMENTAL WORK, AGRICULTURAL DEPARTMENT.

Weather Report.—The season of 1896 has been an unfavorable one for field experimentation, as we have had not only much less than the average yearly rainfall, but during the growing season when the crops most needed moisture, there was a decided shortage in precipitation, which was very unevenly distributed. These abnormal weather conditions interfered very seriously with all the fertilizer tests, especially those with potatoes.

The following is a summary of the rain-fall for this and preceding years at College Park:

YEARS.	1889	1890	1891	1892	1893	1894	1895	1896
Rain fall in inches	59.59	32.29	50.55	41.47	36.22	33.20	35.54	30.27
No. of days on which rain fell	135	151	128	137	102	98	89	85

The following table gives a comparison of the rain-fall at College Park, Washington, Baltimore and Cumberland, together with the normal precipitation for those places. Also the normal temperature and the mean temperature for 1896, at the same places.

PLACE OF RECORD.	TEMPERATURE.		RAIN AND SNOW FALL.	
	Normal.	Mean for 1896.	Normal in Inches.	In 1896 Inches.
College Park, Md.......	54.0	54.3	39.89	30.27
Washington, D. C.......	55.0	55.5	43.46	31.16
Baltimore, Md............	55.3	55.8	43.85	38.59
Cumberland, Md........	51.6	56.7	33.27	38.17

Wheat Experiments.—Variety tests with wheat have been continued during the past season. Twenty-three varieties gave an average yield of 34.1 bushels to the acre. The variety giving the largest yield was the "Nigger" which yielded at the rate of thirty-seven bushels to the acre.

Potatoes.—The same line of investigations have been continued with the potato crop, as mentioned in previous reports. The experiments made the past seasons have been: test of early varieties; fertilizer tests; test of various modes of cultivation; effect of crimson clover plowed down for potatoes; spraying for prevention of blight; and the effect of sulphur in preventing the scab.

Corn Experiments:—The experiments with corn have been in the main working tests. A fertilizer test was also made, and a test of the use of crimson clover plowed down for corn.

Crimson Clover.—The past season we have seeded crimson clover under various conditions of soil surroundings, etc., and in every instance we have obtained a good stand. After early potatoes and on land which grew a crop of tobacco, the stands are as good as could be desired.

After four years experience with this plant we feel justified in saying that one may feel pretty certain of obtaining a catch if they observe four essential points in seeding: first, test the seed before purchasing to be certain that its germanating power is good; second, have the land in thorough order to receive the seed; third, sow not less than fifteen pounds, twenty preferred, to the acre; and fourth, cover the seed lightly after sowing.

Lime Experiments.—One of the most potent agencies for the improvement of our soils and the consequent increasing of our crops is lime; because of this important place which it holds in the farm economy, we have deemed it advisable to commence additional experiments with it during the past year; one of which is the testing of the most profitable amount to apply per acre to the land, taking it through a series of crops. Eight plots are used in this test; plots three and six are used as check plots and received no lime, on the remaining six plots lime was applied at from ten to sixty bushels to the acre. Another test has been the use of lime in connection with green manuring for the improvement of worn out soils.

In the following pages will be found the reports from the heads of the several departments of the Station.

ROB'T H. MILLER,

Director.

REPORT FROM THE CHEMICAL DEPARTMENT.

To the Director:—

Sir:—In accordance with the requirements of the law, I submit the following as to the character of work performed by this department during the past year:

Dairy Experiments.—The experiments being conducted with reference to the dairy may be divided into three general classes:

1st. Feeding tests.
2nd. Creamery tests.
3rd. Breeding tests.

The principal part of the work outlined is of such a nature as to require considerable time before any result or conclusions can be reached, yet at the same time some tests are being carried on which occupy short periods. The results of these will be reported as their importance will justify.

The equipment of the dairy department has been increased by the addition of ten more cows; making the total a herd of twenty. Of the new cows purchased two are registered Guernseys and four registered Jerseys.

Feeding and Digestion Experiments.—During the past year considerable time has been devoted to feeding and digestion tests as a continuation of work commenced some years ago on corn fodder. The result of these tests are reported in bulletin No. 41, "Test of methods for preparing and feeding corn fodder" and bulletin, 43, "Report on the value of a new corn product as cattle food."

Pig and Calf Feeding.—The pig and calf always accompany the dairy industry and their successful management add greatly to the profits; consequently a series of experiments with these animals has been outlined and started in upon with the hope of helping to solve some of the problems for the economical production of pork and veal, and also of finding a profitable market for some of the by-products of the creamery.

Tobacco Work.—This year's work on tobacco was a continuation of of that of last year's; except some modifications were adopted in the plan of the work which experience suggested were necessary. Each year I am more and more impressed with the difficulties which attend experiments with such a crop as tobacco from the fact that it is a plant which is exceedingly susceptible to suroundings during growth and still more susceptible to conditions during curing and the fermentation processes which take place in bulk after curing and stripping. All these make it exceedingly hard to make comparisons with different methods of treatment and still harder to draw conclusions from the results obtained with very small lots of leaf which can be applied to large crops. Again the short period during which the active work on curing and fermentation can be conducted makes the progress of research with such crops very slow.

Fertilizer Experiments.—The experiments with different forms of phosphoric acid and lime which were described in my last report are still under way, but not as yet sufficiently advanced to make any extended report upon. I have now under consideration some plans for special lines of experiments with nitrogenous and potash manures to be conducted on the tiers of plots which are parallel with the phosphoric acid plots. With the inauguration of these tests and conducting them through a series of years, I believe that we may ultimately arrive at some conclusions and formulate principles of fertilization which will be universally applicable all over the state and be much more valuable than the so-called soil test experiments.

Farmers' Meeting and Correspondence.—During this as in previous years, I have attended a number of farmers' meetings, clubs, granges, etc., and discussed subjects relative to farm operations. I have also assisted the director of Farmers' Intitutes in four of the five institutes held up to this time under the law passed by the last Legislature creating a State system of Farmers' Institutes. Most of my talks at these meetings have been upon questions relative to fertilizers, feeding farm animals and the dairy. In these talks it has been my aim to bring the results of our own work before the farmers of the State and at the same time show in a practical way how the latest results of research can be applied to the every day farm operations under the conditions which surround us. These meetings draw on my time to a marked degree and break in upon the home work considerable; yet, I believe, it is time well spent, as we are enabled by such methods to get our results before the farmer in the most intelligible form, and at the same time find out what the farmers are thinking about and what questions are of the most interest to them, and should demand our attention in Station work.

The correspondence of this department is constantly increasing and, in the most part, consists of inquiries relative to fertilizers, feed stuffs and dairying; yet there is a considerable amount of a miscellaneous character, and in many instances on matters foreign to agriculture.

Chemical Work.—The most of the time which has been spent on purely chemical work was in connection with the feeding experiments reported in bulletins, but considerable has been done in connection with experiments still in progress, and also much work of a miscellaneous character. The demands for analyses of a miscellaneous character are constantly increasing, and whenever the samples so sent in are either of public interest, or have some direct bearing on agriculture or horticulture, they are examined gratuitously. Yet, even with these considerations in mind many of the samples which I have examined are of interest to so few that the results of their analyses are not worthy of publication, and in fact, they almost belong to that class of analyses which were done yesterday, reported to-day and to be forgotten to-morrow; consequently, I do not believe that it would be justice to the public or the Station to expend much time on such a class of substances, therefore I reserve the right to select for examination such as in my judgment are of most general interest and permanent value. Considerable time has been expended in studying methods of analyses applicable to our special lines of work. The study of methods is a class of work that does not come directly in touch with the farmer and his operations and consequently does not appeal to him, and he is prone to think of it as a waste of time and money; nevertheless, on a moment's reflection, it will be apparent to all that it is a very necessary part of Station work. In fact, in the planning of an investigation, it is of paramount importance to be sure that the methods to be employed in the carrying out of that investigation are thorough and scrutinizing so that the results obtained may be beyond reproach.

Meteorological Records.—This work has been conducted as heretofore. The records show this to be in some respects one of the most unfavorable years for growing crops in the history of the Station. The amount of rain fall being the smallest yet recorded here and the number of rainy days being less also; again, the quantities recorded for the growing months is but a small proportion of this low total. The following table gives the monthly summary of the temperature and rain fall records.

METEOROLOGICAL SUMMARY FOR 1896.

Temperatures in Degrees—Fahrenheit.

MONTH.	Precipitation.	TEMPERATURES.—MEAN.				Extreme Maximum.	Extreme Minimum.
		Daily Mean.	Maximum.	Minimum.	Daily Range	Record and Date.	Record and Date.
	Inches						
January....	1.81	35.0	42.7	27.3	15.4	62–30th	8–6th
February..	5.51	35.9	44.6	27.1	17.5	58–15th, 23rd	7–22nd
March........	4.61	37.0	47.1	26.8	20.3	69–30th	10–14th
April.........	1.29	55.4	66.1	44.7	21.4	92–17th,18, 19,	24–9th
May..........	2.54	66.2	77.5	55.0	22.5	93–11th	46–30th
June.........	2.00	68.9	79.3	58.5	20.8	92–20th	45–2nd
July	3.23	74.1	83.7	64.5	19.2	92–27th	51–25th
August.......	1.91	73.7	86.1	61.3	24.8	98-6th,7th,9th,	44–20th
September...	4.15	65.7	77.7	53.7	24.0	95–3rd	34–24th
October......	0.44	52.3	63.7	40.9	22.8	79–31st	26–25th
November....	3.50	.2	58.5	35.8	22.7	69–24th	21–23rd
December....	0.28	33.5	42.8	24.1	18.7	63–7th	7–28th
Yearly.......	30.27	54.3	64.2	43.3	20.8	98-August.	7–Feb. & Dec.

In closing permit me to thank you and assure you of my appreciation of the many courtesies and hearty support which you have rendered me in my work.

Yours respectfully,

H. J. PATTERSON,

Dec. 31st, 1896. Chemist.

REPORT OF THE DEPARTMENT OF HORTICULTURE.

Robert H. Miller, Director:

Sir:—The industrial activities of Maryland are widely deversified; pre-eminent among them is horticulture. The horticulturist, as well as the agriculturist, may well congratulate himself upon two acts of recent legislation which cannot fail to be of incalculable benefit to them. The last General Assembly provided for holding Farmers' Institutes in the several counties of the State, and for the appointment of a State Entomologist. These instrumentalities will unquestionably be potent factors in promoting the welfare of the whole State; the former in affording a wider opportunity for obtaining information in regard to the most approved methods in farm practices and results, and the later in preventing the introduction and spread of harmful insects and plant diseases. It is to be hoped the next session of the Legislature will provide in some way for the extermination of the San Jose scale in such places of the State where it has already gained a foothold.

I will take the opportunity in this report to renew a suggestion to those interested in horticultural pursuits as to the necessity and importance of a State horticultural association. The number engaged in horticultural pursuits is relatively larger in Maryland than in any other State; yet most of the States are well equipped with sufficient and enthusiactic organizations, while this State has not advanced beyond the position of a few local organizations. Some of these are rendering efficient service in their several localities, notably of these I will mention the Peninsular Horticulural Association and the Horticultural Association of Montgomery County. What we need is an organization commensurate with the scope of the interest in this State. The Maryland products must face first the competitions of the South and later that of sections North of us. Profit or loss in this enterprise will not infrequently be determined by the amount of information as to markets, varieties adapted to special markets, kinds of packages in which to ship and sell: the most efficient means of combating insect ravages and plant diseases. A State Horticultural Association would afford the opportunity of an interchange of the views and practices upon these subjects with the best equipped men in the State in this pursuit. This information could not fail to be of general advantage.

Experiments Suggested.—In view of the fact that certain of the small fruits are more generally and profitably grown in this State on soils of lighter texture than is found at this Station, I will renew the suggestion to have some variety and fertilizer experiments made on soils of the description above referred to.

Experiments Conducted.—Among the most gratifying of the results obtained along the line of practical horticulture since I had the pleasure of making my last report, I will mention notably the growing of celery by the system of sub-irrigation, the spraying of tomatoes for the blight and the use of the kerosene emulsion for the destruction of the melon louse (*Aphis gossypii*).

Irrigation of Celery.—Celery is one of the plants that for its best development must be supplied during the period of its growth with a sufficient amount of moisture. Surface wetting chances two risks, one of souring the beds by excess of moisture and the other of having the surface bake, and in either case stunting the growth with a consequent deterioration of quality. Sub-irrigation, by use of the ordinary two inch drain tile, avoids both these contingencies. For beds eight feet wide we use two parallel lines of pipe running the entire length of the bed, and placed four to eight inches below the surface; the water being supplied by a stream running along the upper end of the bed. With this method a very much smaller amount of water will be needed and the time necessary for watering the beds will be reduced to a minimum.

Tomato Blight.—The crop of tomatoes in the State the past season was largely curtailed because of the prevalence of the blight. At the Station two adjacent plots were planted under exactly similar conditions; the one plot was sprayed three times with Bordeaux, the other was not sprayed. The fruit was gathered from time to time and carefully weighed, with the result that the sprayed plot gave double the weight of fruit as the unsprayed; while the quality was far superior.

Melon Louse.—The melon louse has been very wide-spread and destructive the past two seasons (*Aphyis gossypii*) particularly to the canteloupe crop. One of the prominent growers, Mr. Jas. Moss, near Annapolis, wrote to the Station early in June that his entire crop had been destroyed the year before, and that his patches at that time were thoroughly infested. Upon examination I found this to be literally true. I had his vines thoroughly sprayed with the kerosene emulsion, giving two applications. The result was that the patches were entirely cleared of the pest and he had a splendid crop of fruit. The aphis ordinarily attacks at first, but a few hills in a field. It multiplies with marvelous rapidity, and spreads from these infested centers over an entire field. When it first makes its appearance, which can be readily seen from the curling of the infested leaves, that is the opportune time to rapidly and successfully combat it.

Yours truly,

JAMES S. ROBINSON,

Horticulturist.

DEPARTMENT OF ECONOMIC ENTOMOLOGY.

To Robert H. Miller, Director:

Sir:—In compliance with your request, I submit herewith a brief statement of the work of this department for the year 1896.

I assumed charge of the Department of Economic Entomology July 1st, under rather peculiar circumstances. The position I hold in connection with the Station is not a full salaried one, but combined with the Department of Entomology of the Maryland Agricultural College under one management. In addition to this, I have been appointed State Entomologist, by Governor Lowndes, without compensation, in accordance with the "Trees and Nursery Stock" law (Sec. 51,) which went into effect immediately after its passage and approval April 2, 1896.

State Work.—The prosecution of the State work has required a very much greater amount of time than was originally anticipated. It has necessitated my presence in every county in the State, and some of them many times, since the first of August. This has afforded me an excellent opportunity of acquainting myself with the various economic problems, entomological and botanical, peculiar to every county.

In the performance of my duties as entomologist, I have met with no opposition, and nurserymen, horticulturists and agriculturists have assured me their hearty support and co-operation.

The correspondence which the State work has entailed, has been simply enormous, occupying during the shipping season of nursery stock, almost my entire time. Letters addressed to this office, asking information, cannot be answered hurriedly. They are often accompanied by specimens for identification and determination, and a reply to be of any value to the average farmer must be as free as possible from scientific terms, yet technically correct.

Noxious Insects.—Of the insects that have attracted public attention, the San Jose scale (*Aspidiotus perniciosus*) stands first upon the list. It is the most dangerous orchard pest now established in Maryland, and and seemingly defies individual efforts for its suppression and control. Contrary to former reports, it has been eradicated at but one place, Garrett County, so far as recent examinations go. I have located it in four counties, making eleven in all, representing eighteen localities.* Wherever the pest has been called to the attention of the owners, they have shown praiseworthy energy in the application of remedies and the destruction of trees for its check and suppression. If the pest is ever exterminated from our State, it will be by the concerted action of nurserymen, horticulturists, fruit growers and others concerned, in co-operation with the State officers, backed by State legislation.

Next to the San Jose scale, the melon plant louse (*Aphis gossypii*) has caused more damage in our State than any other insect this season.

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*Since this report went to press two additional counties, Caroline and Somerset, have been added to the list.

Hundreds of acres of canteloupes have been destroyed by it in Baltimore, Anne Arundel, Prince George, Charles, Calvert, St. Mary's, Wicomico, Somerset and Dorchester counties the latter part of June and early in July.

The rose chafer or rose bug (*Macrodactylus subspinosus*) has been very injurious to grapes and peaches over a large part of the state, being particularly destructive in the lower counties of the Peninsula.

The asparagus beetle (*Crioceris asparagi*) has been exceedingly abundant over a large part of the State. The 12-spotted species (*C. 12-punctata*) has also been quite common and is spreading to new localities.

The cabbage worm (*Pieris rapæ*), the cabbage bug (*Murgantia histrionica*), and the cabbage Plusia (*P. brassicæ*), have occasioned an enormous loss to truck gardeners over the entire State. The latter has been particularly destructive to late cabbage.

To strawberry, the strawberry weevil (*Anthonomus signatus*), was very destructive over a large part of the State. To potato, the potato-stalk weevil (*Trichobaris trinotata*) has done much damage in Baltimore and Harford counties. The Colorado potato beetle. (*Doryphora 10-lineata*), and the blister beetle. (*Epicauta cinerea*), have been serious pests the past season. The old-time tobacco worm (*Sphinx carolina*), has been very injurious in the tobacco growing sections of the State.

The peach has suffered severely from the attacks of the plum curculio (*Conotrachelus nenuphor*). Much of the fruit ripened prematurely and fell. The codling moth (*Carpocapsa pomonella*), aside from doing much damage to apples. has been very common in pears.

The fruit bark beetle (*Scolytus rugulosus*), has been quite common in some orchards in Prince George and Caroline counties. The peach-tree borer (*Sannina exitiosa*) and the woolly apple-louse (*Schizoneura lanigra*) have both been found quite common in orchards and in some nurseries. The pear-tree Psylla (*Psylla pyri*), occurred in a few orchards in Kent County. The pear-slug (*Eriocampa cerasi*), the bag worm (*Thyridopteryx ephemeraeformis*) and the pear-leaf mite (*Phytoptus pyri*), have been common in several nurseries.

The army worm (*Leucania unipuncta*) was exceedingly destructive to millet, grass and late corn in September in Allegany, Caroline and Worcester counties. Wireworms were reported to me at the Rockville meeting of the Montgomery County Farmers' Institute as having destroyed a large portion of the corn in sections of that county this season. The Angomois grain moth (*Gelechia cerealella*), erroneously called "white fly" or "weevil," has been, and is very seriously damaging stored grains, especially wheat and corn, throughout the State.

Prominent among scale insects that have been mistaken for the San Jose scale, and sent to the office for determination are the following: The oyster shell bark louse (*Mytilaspis pomorum*), scurfy bark louse (*Chionaspis furfurus*), grape scale (*Aspidiotus uvæ*), rose scale (*Diaspis rosæ*), Euonymous scale (*Chionaspis euonymi*) and the peach Lecanium (*Lecanium persicæ*). All these scales are common over the State and have done more or less damage in orchards and gardens.

In regard to all the insects cited above, whether sent to the office for determination, or discovered by the writer, the remedy for their control has been given in each instance.

Plant Diseases.—That disease, peculiar to peach and allied fruits, commonly called yellows, occurs in all parts of Maryland, except the extreme southern counties of the Peninsula. It has been very disastrous in orchards this season, and is a threatening danger to our peach industry. It has not been uncommon in the great peach growing belt of the Blue Ridge Mountains. The real cause of this disease is still a mystery, and no effective remedy has been found other than the immediate destruction of trees showing the first signs of affection.

The pear blight, or fire blight. caused by a contagious bacterial disease known to science as *Bacillus amylovorus,* has been common and destructive to both pear and apple-trees throughout the State this season. It does not confine its attacks to the pear and apple, but is a serious pest to other pomaceous fruits as well. It can be kept in check by careful pruning, and prevented, to a certain extent, by spraying with Bordeaux mixture.

Both tomato-leaf and potato-leaf blights have been exceedingly destructive this season. These troubles could be averted, to a large extent, by the judicious application of Bordeaux mixture.

The new disease of the peach, discovered by me in several counties this season, is being studied, to which reference is made below.

Experimental Work.—I have now under way a series of experiments with a new disease of the peach, cited in my recent bulletin. (Bulletin No. 42). It is my purpose to determine, if possible, whether this disease is communicable by budding or not. I am also testing the vitality and longevity of the diseased trees. Besides, I am having a mechanical and chemical analysis of the soils made, and will endeavor to restore the trees by treating the soils in various ways with manures and commercial fertilizers.

To obtain, if possible, a wash which would be cheaper than the whale-oil-soap wash now used against the San Jose scale, I have an experiment under way in a large orchard in Kent County. I have endeavored to cheapen the cost of the materials used by combining the whale oil soap with pure kerosene and with kerosene emulsion in various strengths.

Preparations are now being made for a series of experiments the coming spring against the strawberry weevil (*Anthonomus signatus*) and the melon plant louse (*Aphis gossypii*), and the rose chafer or rose bug (*Mierodactylus subspinosus*), three very important economic insects.

Publications.—In Bulletin. No. 42, of the Station, I have given a copy of the Maryland "Trees and Nursery Stock" law, and special information regarding it: a brief summary of the present condition of the nurseries and orchards of the State, referring especially to the San Jose scale, yellows, and a new disease of the peach. The attention of nurserymen and fruit growers is called to a disease of the peach, commonly called "Rosette," not yet established in our State.

I have been an occasional contributor to our State press and agricultural papers on topics of local economic importance and interest, and have presented five papers on economic subjects before scientific societies.

Addresses.—I have been called upon from time to time to address farmers' meetings, institutes, clubs, granges, horticultural societies, etc. The topics discussed have been of a practical nature, usually upon insect pests or plant diseases. I believe that great good is gained, and the department strengthened, by the actual contact with the people brought about by these meetings. Questions are asked relative to insect and plant injuries, that would never reach the department in any other way; and oftentimes some of the most important insects are brought to my attention in this manner.

Equipment.—The department is fairly well equipped for experimental and investigation work. The office has been furnished with the necessary furniture.

The cabinet of insects is very incomplete. It was the purpose of my predecessor, the late Dr. C. V. Riley, to have made a representative collection of our State fauna, from collections made at the Station, and from duplicate material in the national collections under his charge. I would strongly recommend that the cabinet be completed by purchase and collection as soon as possible. Such a collection would be of invaluable service to the officers of the Station, to students, and to the State at large. During the past summer I have collected and bred several hundred specimens which have been added to the collection. Some of these are very rare hymenopterous parasites.

I would strongly recommend that the files of Government publications in the Station library be completed and the necessary entomological works be added, as the absence of these works very materially interfere with the work of the Station staff in looking up references and effect original research and investigations.

The interest that has been shown by the people of the State in the subject of applied entomology, and from the importance of the subject, I cannot refrain from saying that I believe the Station would be justified in increasing the allotment to the Department. An additional appropriation would render it very much more effective, particularly in the line of original investigation.

Very truly yours,

WILLIS G. JOHNSON,

Dec. 31st, 1896. Entomologist.

REPORT OF THE PHYSICIST.

To Robert H. Miller, Director:

Sir:—The investigation of the soils of Maryland have been continued along the same lines as formerly. The preliminary survey has been practically completed so far as the geological structure has been determined; that is, all the important soil areas have been visited, the conditions of the soil in the field carefully examined, the relation to crops considered, and samples of the soil and subsoil taken for examination in the laboratory. This material has been examined and the cause of the difference in agricultural value of the areas and their adaptation to crops clearly determined. With the completion of this preliminary work Mr. S. Key severed his connection with the Station, and Mr. C. W. Dorsey was appointed.

Mr. Dorsey has commenced a detailed study of each of the areas to see what local differences there are in the soils. He has already made such an investigation of the soils of the Hagerstown Valley, and in Bulletin, No. 44, has pointed out some very interesting facts connected with the distribution of crops in the Valley.

It is proposed to continue this work along these lines and make a detailed investigation of the soils of the State with the ultimate object of being able to map the areas adapted to different classes of crops.

Very truly yours,

MILTON WHITNEY,

Physicist.

REPORT OF THE VETERINARIAN.

To the Director:

Sir:—In compliance with your request, I submit the following recommendations for the Veterinary Departments of the Station.

Inasmuch as experiments upon animals would incur considerable expense for the necessary buildings, apparatus and attendants; and the results be more or less distant, I would suggest:

First.—That a series of bulletins be issued, embracing practical information upon the care and management of farm animals. For example, the following topics ought to be discussed: Horse shoeing. How to locate a lameness in horses. How to properly disinfect a contaminated premises. The principles of hygiene in the construction of stables, &c.

Second.—To investigate the feasibility of co-operative butcher shops in various parts of the State, whereby the producer can realize the greatest returns from his animals.

Third.—To investigate the malady known as Cerebro-Spinal Meningitis found very extensively upon the Eastern Shore of Maryland.

Fourth.—To co-operate with the State in investigating the sanitary conditions about us, and aid in perfecting them.

Hoping that these suggestions will appeal to you as some of the most important needs for the agricultural interests about us, I am

Very respectfully yours,

SAM'L. S. BUCKLEY, D. V. S.

December 31st, 1896.

FINANCIAL REPORT, 1895–1896.

Joseph R. Owens, Treasurer, in account with the Md. Ag'l Expt. Station.

1895.	SOURCES OF REVENUE.		DR.
July, 1,	To unexpended balance	$ 616.34	
1896.			
June 30,	To receipts from the Treasurer of the United States in four payments, per appropriation for the year ending June 30, 1896, under act of Congress, approved March 2, 1887	15,000.00	
1895.			
Dec. 23,	Check from Md. Ag'l College	79.81	
1896.			
June 30,	To sale of dairy products	315.39	
" 30,	To sale of farm products	338.66	
			$16,350.20

1896.	NATURE OF EXPENDITURES.		CR.
June 30,	By salaries	$7,619.10	
" 30,	" labor	2,276.46	
" 30,	" publications	962.26	
" 30,	" postage and stationery	76.43	
" 30,	" freight and express	139.15	
" 30,	" heat, light and water	309.71	
" 30,	" chemical supplies	85.10	
" 30,	" seeds, plants and sundry supplies	302.30	
" 30,	" fertilizers	57.90	
" 30,	" feeding stuffs	397.54	
" 30,	" library	105.42	
" 30,	" tools, implements and Machinery	836.44	
" 30,	" furniture and fixtures	3.15	
" 30,	" scientific apparatus	38.06	
" 30,	" live stock	487.75	
" 30,	" traveling expenses	306.38	
" 30,	" contingent expenses	241.76	
" 30,	" buildings and repairs	2,017.57	
" 30,	" unexpended balance	87.72	
			$16,350.20

We, the undersigned, duly appointed auditors for the corporation, have examined the books and accounts of the Maryland Agricultural Experiment Station for the fiscal year ended June 30th, 1896, that we have found the same well kept and classified as above, and that the receipts for the year are shown to have been $16,350.20, and that we have found the corresponding disbursements to have been $16,262.48. Vouchers for the disbursement of this sum are on file, and have been examined by us, and are found correct, thus leaving an unexpended balance of $87.72 to be accounted for by the Treasurer in the year beginning July 1, 1896.

True copy
Test:—Jos. R. Owens,
Registrar and Treasurer.

(Signed.)

Shyrock, } *Auditing Committee of*
t, } *the Board of Trustees.*

Maryland & Rare Book Room
University of Maryland Library
College Park, Md.

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